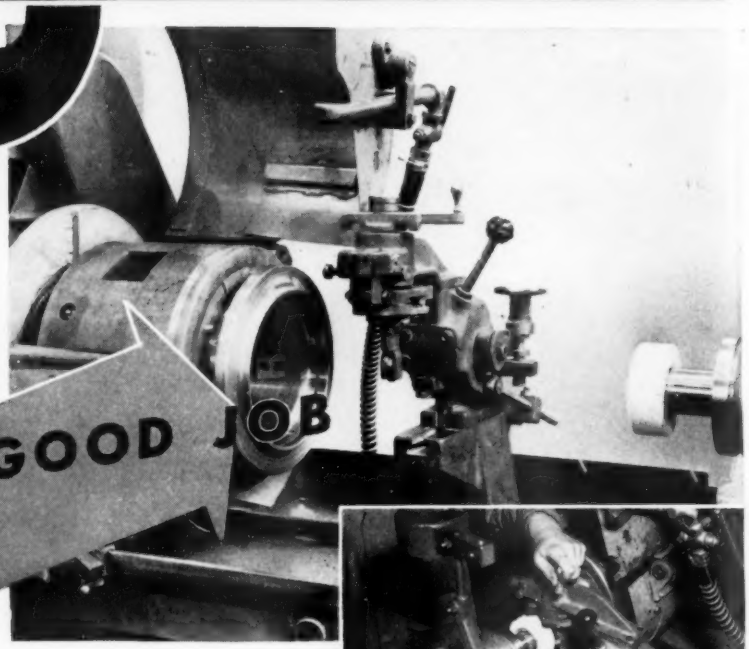
How to Run a Drilling Machine—Page 97

THIS MIGHT GET YOU OUT OF A JAM
In truing Radii and Angles



BUT FOR A GOOD JOB

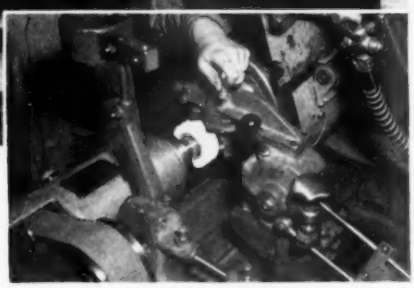
YOU'LL WANT THE HEALD UNIVERSAL DIAMOND

If the work ground on your Heald No. 72A Plain Internal is all straight-hole grinding the standard truing diamond is exactly what's required to do a good job of wheel truing. But if you have work that involves grinding of radii and tapers as well as straight surfaces, the standard diamond of course will take care of straight truing but not radii or tapers.

For truing wheels to special shapes two different methods can be employed. One method requires no more equipment than an abrasive stick, but should be considered only as a temporary expedient. Using this method the operator holds the stick in his hand and manually trues a radius or chamfer on the corner of the wheel, using a template for checking contour. Even with an experienced operator this is a cut and try procedure and consequently is inaccurate and slow.

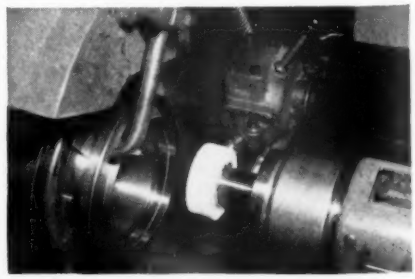
The recommended process, if you want speed and accuracy in truing special shapes, is to replace the standard diamond unit with the Heald Universal Diamond. This truing device consists of a basic unit which can be furnished with three quickly interchangeable diamond attachments each specifically designed for the separate operations of radius truing, angular truing, and straight truing as illustrated.

Here's a really useful attachment which will give your Heald No. 72A Plain Internal extra flexibility for grinding a greater variety of work. Can be furnished as original machine equipment or supplied for attaching in the field.



The Heald Universal Diamond arranged with radius truing attachment. Trues wheel radii from 0 — 2½".

Heald Universal Diamond equipped with angular truing attachment. Trues wheel angles from 0 — 90°, has 1¼" stroke.



Heald Universal Diamond with straight truing attachment.

THE HEALD MACHINE CO. WORCESTER MASS. U. S. A.

AMERICAN MACHINIST

April 15, 1943

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AMERICAN MACHINIST chips

Keeping on Top "Down Under" . . . *From Sidney, Australia, comes another bit of evidence that the supply lines of production data reach far and wide. A. B. Berry, Manager of the Australian Optical Co., Ltd., writes this in his request for manufacturers' literature featured in our columns:*

"Here in Australia we feel these publications are necessary to keep us abreast of the times and to enable us to select the various types of equipment necessary for the manufacture of all kinds of optical goods and instruments. Your journal is read enthusiastically by all members of our staff and it is due to their numerous requests for up-to-date trade literature that we are forwarding this request."

o

Ye Olde Art of Welding . . . We noticed an interesting item in one of these "strange facts" cartoons which appear in the newspapers. It seems that welding, so important in today's war production, was practiced by Egyptians as far back as 1500 B.C. Bet the ancients wouldn't know their process today!

o

Crystal Gazing vs. Forward Thinking . . . *Once in a while you hear the somewhat bitter comment that we'd all be better off to forget this business of post-war planning and concentrate on the job of beating the Axis. That, in our humble opinion, all depends on what type of planning you're doing and how you're going about it.*

Certainly there is a lot of guff being dished out on the subject, and a lot of wishful, wasteful thinking going the rounds. On the other hand, post-war planning is not necessarily counting your chickens before Hitler lays an egg. It can be and should be the logical, healthy process of the alert business mind at work.

War or no war, it would be a mighty poor executive who failed to figure out his future course. He'd be a dangerous guy to associate with . . . like the motorist who keeps his eyes glued on the radiator cap instead of watching the road ahead.

The main thing, as we see it, is to avoid trying to solve the problems of the universe and stick to our knitting . . . which happens to be Metal-Working. To keep a sharp eye out for new developments and trends (such as the enormous increase in precision manufacture) which may directly or indirectly affect our products or markets. To think a step ahead of competition, just as we would at any time. And above all, to face 194X with minds tempered by realism but vigorously searching for the opportunities that will await us.

We all shudder at the futility of "winning the war and losing the peace". When Johnny comes marching home, we want him to step into an honest-to-goodness job. To provide that job is industry's job . . . so let's get on with it.

o

Hang On to Your Copies of AM . . . Quite frequently we get calls for back numbers of *American Machinist* to fill out the library of issues most of our readers maintain. In the old days, we could usually scrape up enough copies . . . but with the paper cut and all we haven't enough margin (no pun intended) to fill many requests for extra 1943 issues.

It seems a good time, then, to remind you of that ancient and honorable custom of binding copies to keep them intact and readily accessible. That's the practice of many firms, including the Mesta Machine Co. of Pittsburgh. They write: "We have been binding the *American Machinist* magazine since 1939 and receive numerous calls from our Engineering and Operating Departments for back articles."

And we hope everyone will pardon us if we add that they also say "We find the *American Machinist* to be the best publication of its kind available to our Engineering Staff." (*Advt.*)

Thanks for them few kind words, Mr. Dan Reebel of Mesta.

ASTE Exhibition . . . *A busy place was the Milwaukee Auditorium last month. We'll leave the detailed reporting of this wartime event in more capable hands. We would like to go on record, however, as saying that we thought it was a bang-up show. There may have been larger turnouts in the past . . . we dunno. But for downright interest and liveliness, it was hard to beat. One got the impression that the visitors were of unusually high calibre, seriously looking for information to help them do a better job. They weren't disappointed, either. Considering the times, there were lots of products on display . . . most of them operating. There were new developments, ideas, interesting presentation devices. In a lighter vein, we noticed that most of the glamour girls who usually brighten up those prosaic industrial gatherings had given way to petite, young workers in slacks. Not only cute, they also knew their stuff when it came to running a machine.*

All in all, we'd say, the 1943 ASTE get-together was really worthwhile.

o

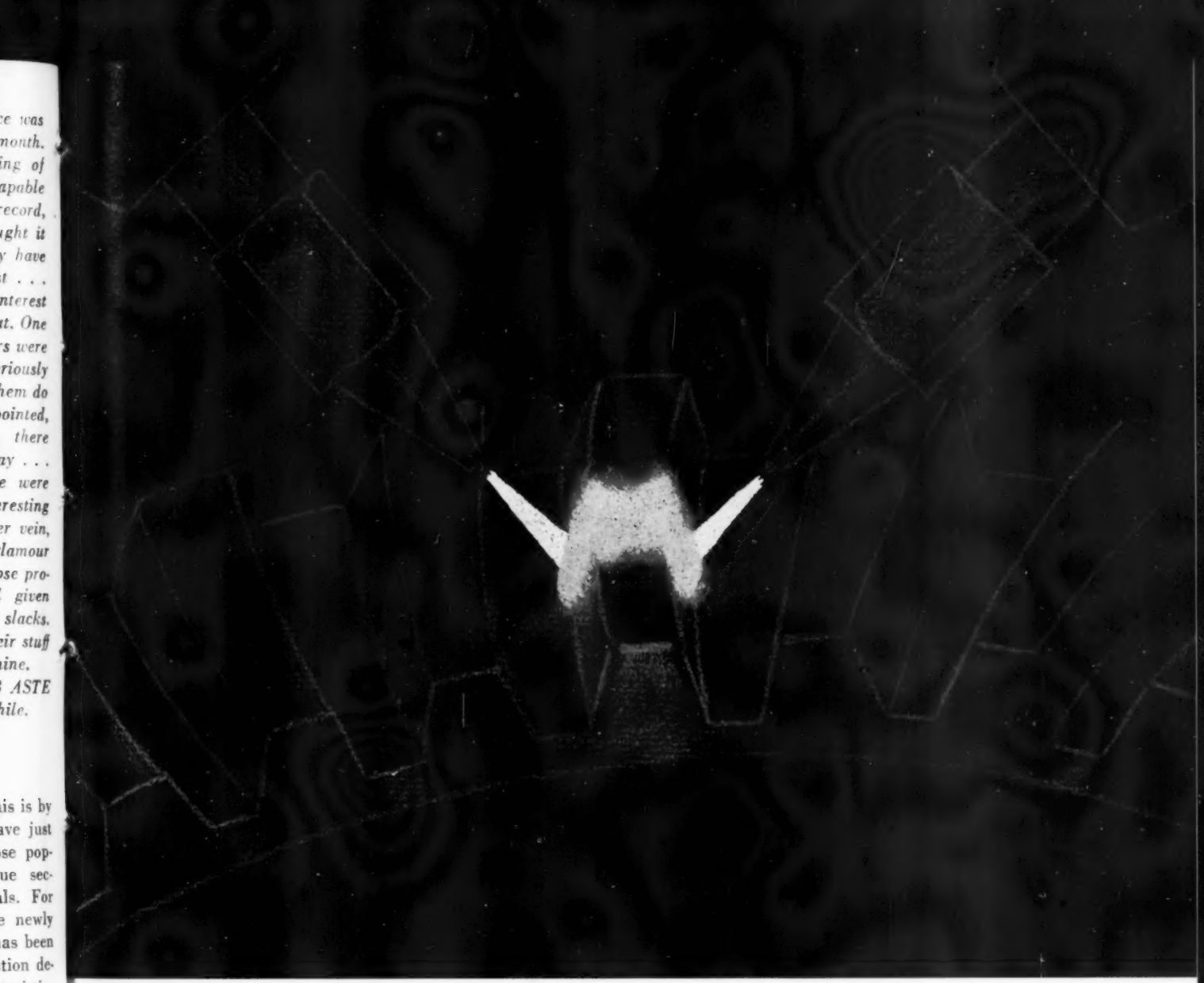
Know-How on Materials . . . This is by way of advising you that we have just had reprinted a number of those popular *American Machinist* "blue sections" on Working of Materials. For the benefit of readers who are newly come into the fold, this series has been appearing since 1938. Each section details in handy fashion characteristics of a particular material, or group of materials, and gives practical data on fabrication.

Somewhere in the neighborhood of 125,000 reprints have been distributed to date, so they're obviously providing many a Metal-Working shop with useful data.

If you would like extra copies (at a mere 15c. each to keep us from going in the red on cost of printing) the following subjects are available:

Working of Aluminum Alloys
Working of Magnesium Alloys
Working of S. A. E. Nickel Alloy Steels
Working Stainless Steels
Alternate Steels for Emergency Use
Working of Carbon Sheet Steel
Working With Cutting Oils
Working of National Emergency Steels

Just write to the same place, *American Machinist*, same address, 330 W. 42 St., New York, N. Y. and we'll be glad to handle your request.



Controlled SURFACE HARDENING

with Gleason precision machine-tool equipment offers these distinct advantages:

direct hardening control . . . simultaneous hardening of both sides of tooth . . . desired penetration with burner speed control . . . same hardening time and depth for each tooth - - automatic speed control maintains uniform hardness on ends and throughout tooth length.

freedom from stress and distortion . . . small section of tooth heated at one time, with rapid heat diffusion through cold gear body, eliminating necessity of liquid quench.

metallurgically correct hardening . . . greatest hardness on tooth sides with gradual transition to unaffected core.

wide range of application . . . two machines cover broad range of straight and curved-tooth bevels, hypoids, spurs, helicals, internals above 24 D. P. up to 120" diameter.

fast, economical operation . . . only two simple inexpensive burners to change . . . short set-up time . . . no subsequent drawing necessary.

Write for our book "The Surface Hardening of Gear Teeth"

GLEASON

GLEASON WORKS

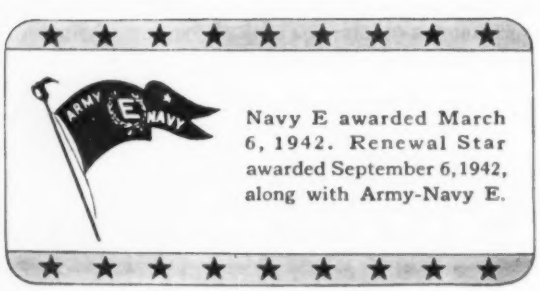
Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.

ARMY E NAVY

In the illustration above a CINCINNATI 0-8 Plain Automatic Milling Machine equipped with automatic Rise and Fall Spindle Carrier is milling the lower edge of shoulder and radius on inside corner of block for closing breech.

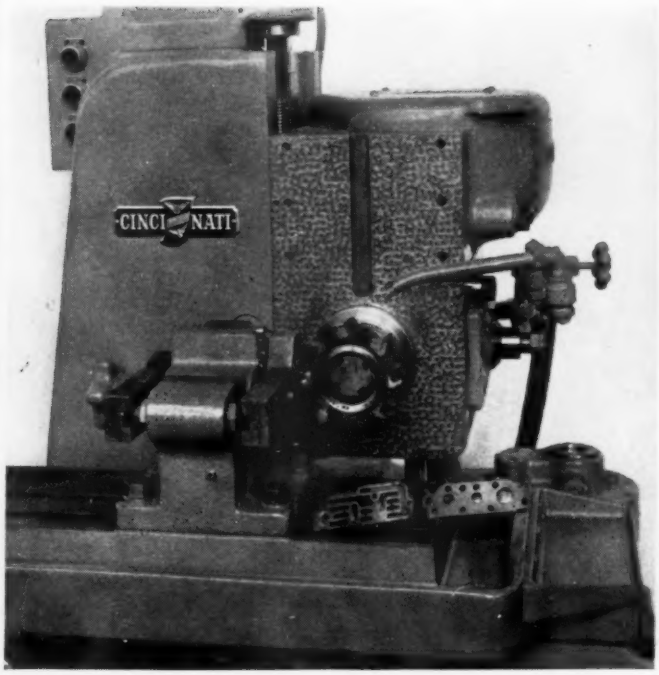
CINCINNATI



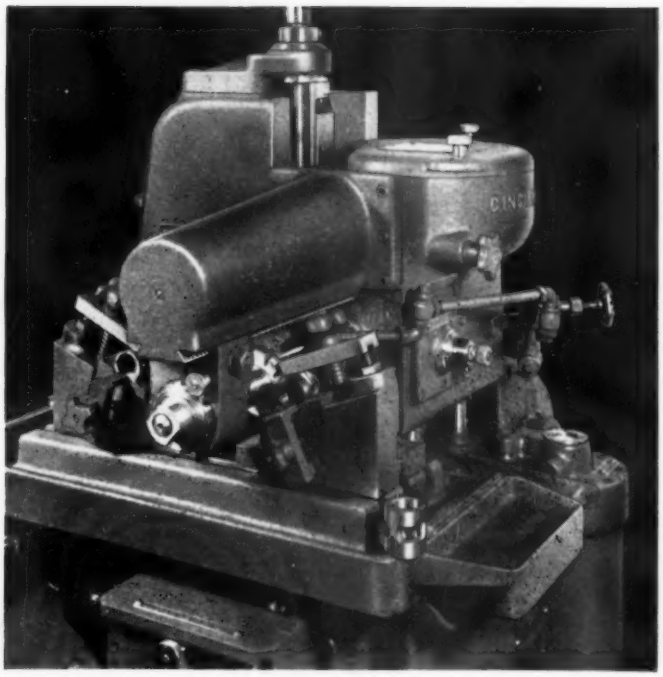
Navy E awarded March 6, 1942. Renewal Star awarded September 6, 1942, along with Army-Navy E.

THE CINCINNATI

MILLING MACHINES



Milling faces on valve body. This CINCINNATI 0-8 Plain Automatic Milling Machine is equipped with a two station fixture for finishing one complete part each cycle of the machine.



Milling two slots in liner sleeves. Here a CINCINNATI 0-8 Milling Machine is handling two distinct operations for each complete milling cycle. The machine is cutting continuously.

ANGUARD•••
OF WAR PRODUCTION

CINCINNATI 0-8 Plain Automatic Milling Machines, with automatic Rise and Fall Spindle Carrier, are *leading the pack* when it comes to fast, accurate, economical production of small parts in any quantity. Horizontal cuts, vertical cuts, a vertical and then a horizontal cut, two accurately spaced vertical cuts . . . in fact, with this versatile milling machine, almost any conceivable operating cycle may be used. It's a mighty handy miller.

You'll be interested in all the details of the CINCINNATI 0-8 Plain Automatic Milling Machine with automatic Rise and Fall Spindle Carrier which the engineers here at Milling Headquarters have developed to an unusually high degree of efficiency and usefulness. Write for specification catalog M-964 which gives complete information on all features and benefits. Or, look in Sweet's Catalog File for a brief description.

MILLING MACHINE CO. CINCINNATI, OHIO, U. S. A.

BROACHING MACHINES • GRINDING MACHINES • LAPPING MACHINES

You look very pretty in your new Spring bonnet — and we like your choice of face powder, too. In fact, you're one of the best dressed women in the country, these days, and we've something important to say about you to the men of American industry.

This young woman is doing a man-sized job. A job that was once believed impossible for a woman, and she's doing it as well as any man could do it. She is typical of hundreds of thousands of women who are working today on America's most efficient assembly lines. Recently, a major aircraft company sent out a call for 20,000 women workers to "man" a single plant, and America's shipyards are employing women at the rate of several thousand a week — women for every conceivable kind of job, from the toughest foundry work to the finest machine tool operation.

Yet there are still many smaller plants that are employing few or no women workers, and America is approaching the bottom of the manpower barrel. Because of this, the U. S. War Manpower Commission urges (a) the use of more than 3,500,000 additional women in industry, and (b) the breakdown of discrimination against the handicapped, and other minority groups.

★

On the right is a list of some of the jobs that women are able to fill today, from the record of America's leading war-production plants:

OCCUPATIONS

★

Professional and Managerial
Chemist, Organic
Draftsman, Mechanical
Chemist, Asst. II

Skilled
Airplane Woodworker
Gear Shaper Operator
Internal Grinder Operator
Inspector (machine shop)
Sheet Metal Worker, Aircraft
Welder, Acetylene
Assembler (firearms)
Electrician, Airplane
Radio Equipment Assembler, Special
Rotor Assembler
Lens Grinder

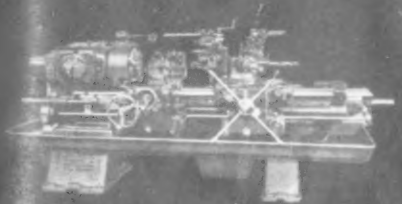
Semiskilled
Solvent Recovery Man
Inspector (ammunition)
Turret Lathe Operator, Automatic
Milling Mach. Op. Auto.
Multiple Spindle Drill Press Operator
Assembler, Electrical
Welder, Spot
Punch-Press Operator
Solder I
Welder Helper, Arc
Chassis Assembler II
Armature Winder I
Coil Winder I
Circulating-Process Inspector
Pull-Socket Assembler
Detail Assembler (aircraft)
Final Assembler I (aircraft)
Riveter, Aircraft
Sheet-Metal Worker, Apprentice

Unskilled
Process Laborers
ammunition
machine shop
tinware
nonferrous metal alloys and products
machine tools and accessories
radio manufacturing
electrical equipment
aircraft manufacturing
Laborers
explosives
ammunition
nonferrous metal alloys and products
radio manufacturing
machine tools and accessories

JONES & LAMSON
MACHINE COMPANY

Manufacturers of • Universal Turret Lathes • Fay Automatic Lathes
Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies

Springfield, *Vermont,* **U. S. A.**



SADDLE TYPE
UNIVERSAL TURRET LATHES

PROFIT-PRODUCING
MACHINE TOOLS

RAM TYPE
UNIVERSAL TURRET LATHES

WAR PRODUCTION BULLETIN

In Britain and America, alike

the manufacture of ROLLS-ROYCE *engines entails the incorporation of the finest gears experience knows how to make, and the best methods which include, cutting on* FELLOWS GEAR SHAPERS *with Original Fellows Cutters*

WHEN A Spitfire **OR**

GEAR SHAPED CU

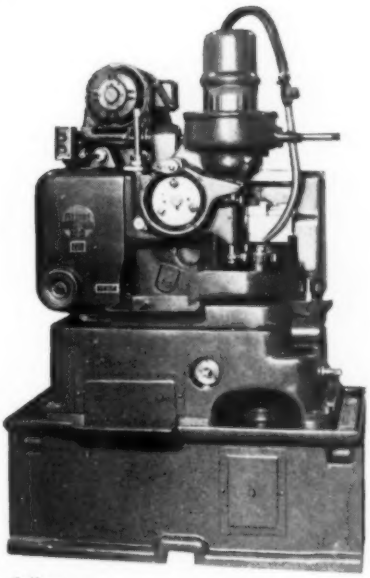
Official Photograph, U. S. Army Air Forces

FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTIO

ir OR A Curtis P-40 F REVS UP,

PECUT GEARS DO THEIR STUFF



Fellows
7-type High Speed Gear Shaper

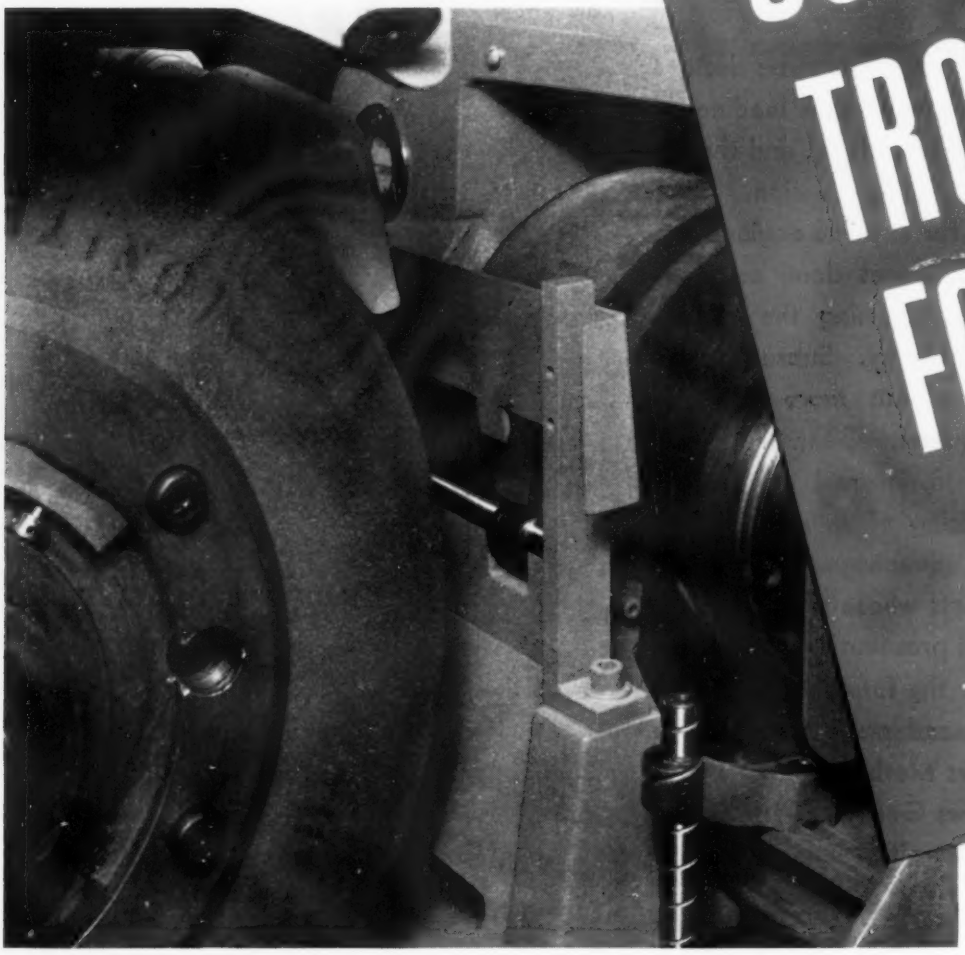
Gears for airplane engine use must be designed, and made for the maximum tooth loading. This requires the use of the best steels, and the highest possible accuracy in production. In the manufacture of gears for airplane engines, original cutting, is in most cases done on Fellows Gear Shapers, thus establishing the basis for control over tooth accuracy. Subsequent machining operations are thus more easily and economically accomplished. Gear Shaper flexibility in handling both internal and external gears, and in the cutting of splines and other parts is of decided advantage. Fellows Machines, like the products whose parts they are making, are "doing their stuff" in the successful prosecution of this global war. It is not too early to start your plans for the future by keeping posted on the latest developments in machines and production methods. A copy of the latest edition of "The Fellows Method" may help in this connection. For your copy, write: The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Bldg., Detroit, Michigan, or 640 West Town Office Bldg., Chicago, Illinois.

S Method

. . . . FROM BLANK TO FINISHED GEAR

GRINDING OUT MORE TROUBLE FOR THE AXIS!

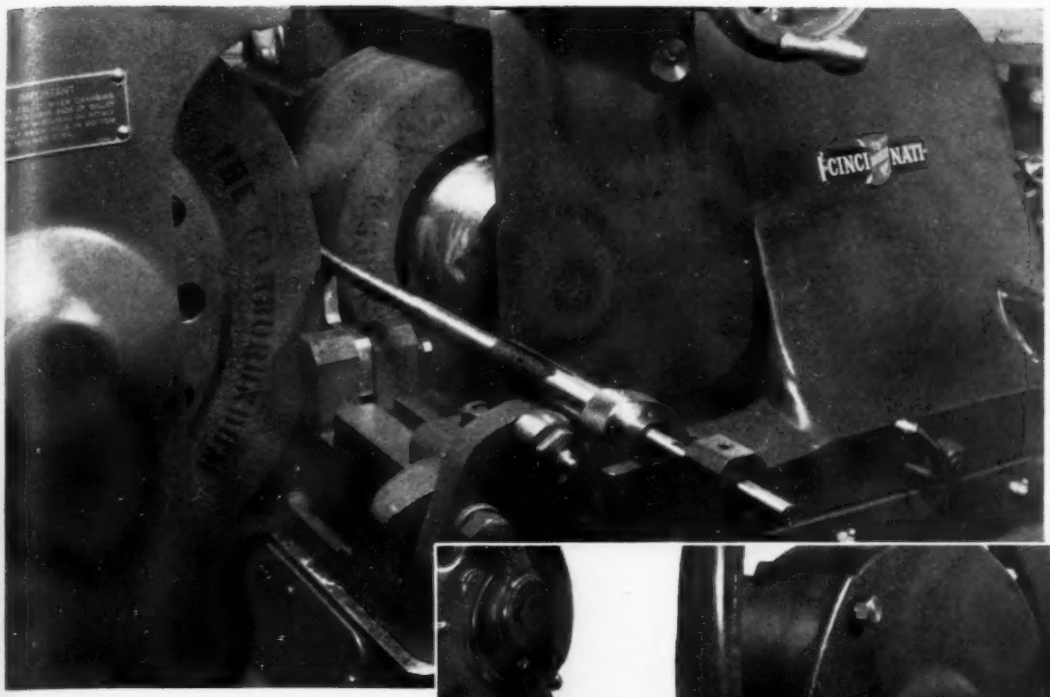
CINCINNATI No. 2 Centerless equipped with one 5" face and one 1" face wheel. Both bearing diameters on this crankshaft are ground simultaneously by the infeed method. On this machine the equipment includes a special device for loading and removing the work vertically. Accuracy, .0005" on diameters; .0002" in straightness.



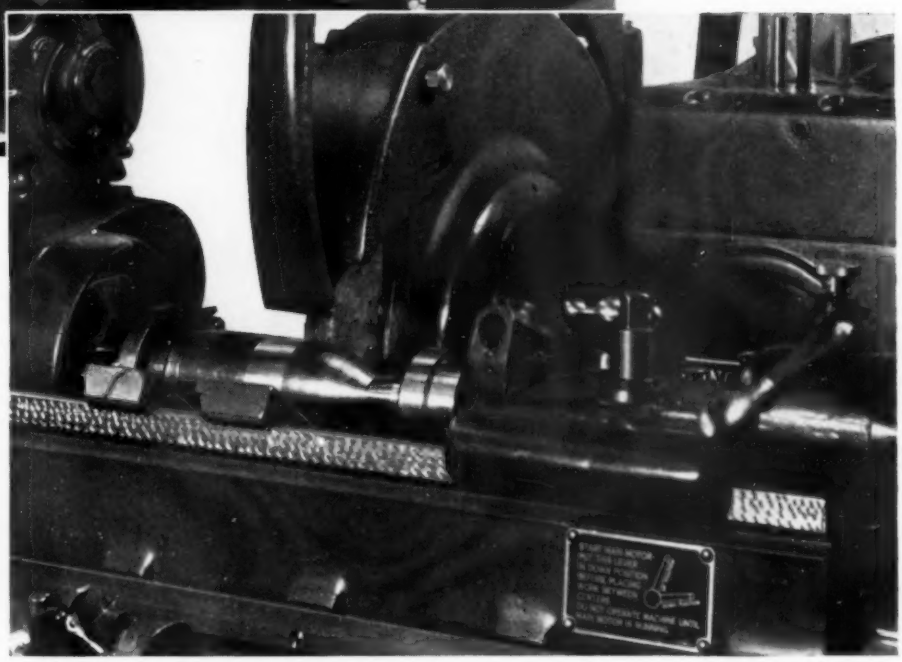
Navy E awarded March 6, 1942. Renewal Star awarded September 6, 1942, along with Army-Navy E.

CINCINNATI

CENTER TYPE GRINDING MACHINES



CINCINNATI No. 2 Centerless grinding a rifle barrel. This is an excellent example of concentric centerless grinding of multiple diameter work.



Grinding bourrelet diameter of 75 mm. shell on CINCINNATI Plain Hydraulic Grinder equipped with hydraulic footstock and work holding cradles.

Illustrated are a few examples of how CINCINNATI Grinding Machines are making it increasingly tough for the Axis. There are many other unusual production stories which prove the usefulness, adaptability, and importance of CINCINNATIS in the prosecution of the war. Whether it's cylindrical or centerless grinding, CINCINNATI Grinders are turning out war essentials with a speed and accuracy undreamed of a few years ago.

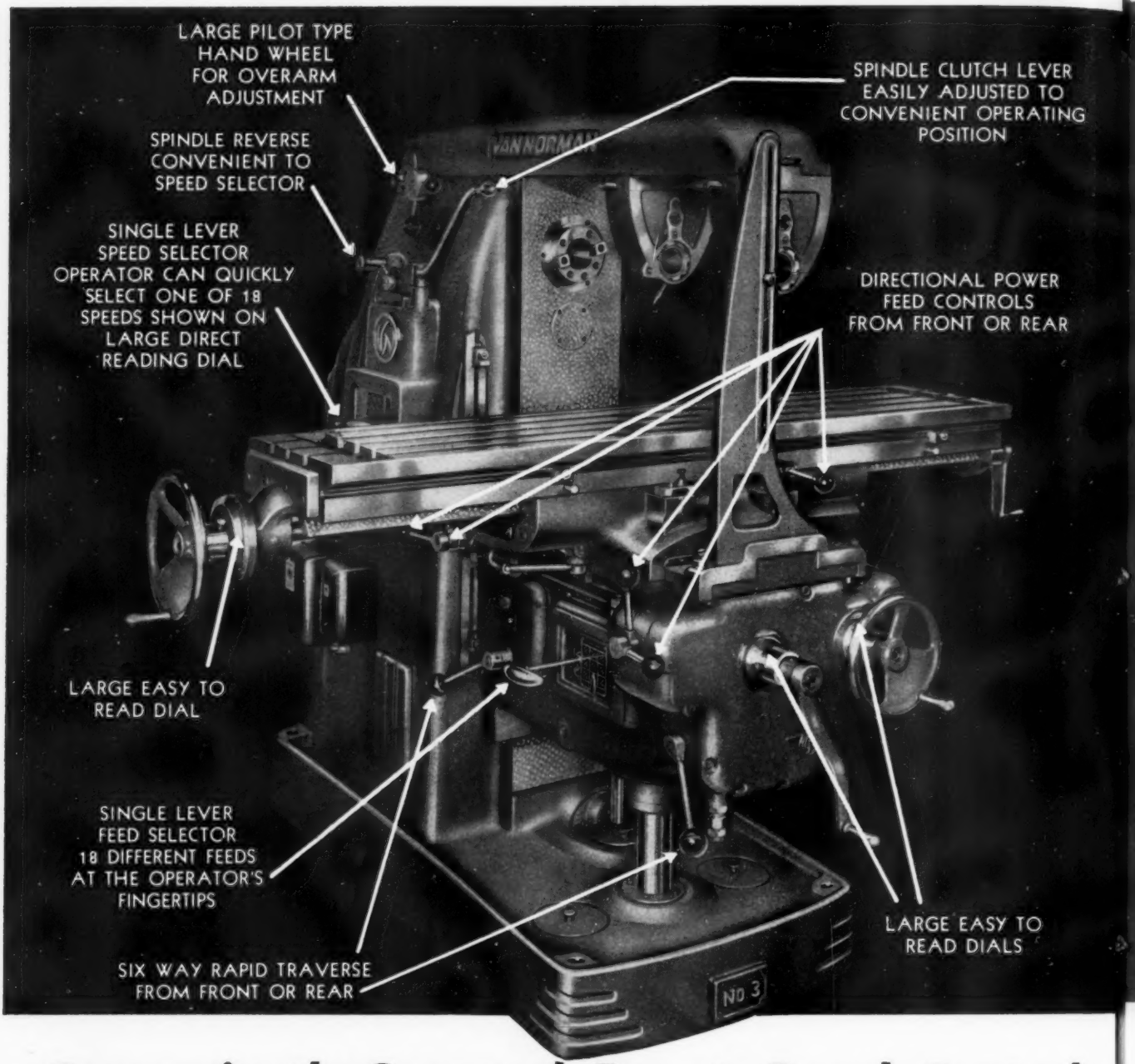
Much of the success of these grinding machines is due to the skill of the engineers here at Grinding Headquarters who are constantly developing new methods and finding wider applications for CINCINNATI Grinders. This group of experts will gladly offer suggestions and recommendations to help you get more out of your CINCINNATI Grinding Machines. You are invited to use the services of these authorities at any time.

Sweet's Catalog File gives a brief description of all CINCINNATI Grinding Machines. More detailed information about any or all of these machines will be sent on request.

GRINDERS INCORPORATED

CINCINNATI, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES


LARGE PILOT TYPE HAND WHEEL FOR OVERARM ADJUSTMENT
SPINDLE CLUTCH LEVER EASILY ADJUSTED TO CONVENIENT OPERATING POSITION
SPINDLE REVERSE CONVENIENT TO SPEED SELECTOR
SINGLE LEVER SPEED SELECTOR OPERATOR CAN QUICKLY SELECT ONE OF 18 SPEEDS SHOWN ON LARGE DIRECT READING DIAL
DIRECTIONAL POWER FEED CONTROLS FROM FRONT OR REAR
LARGE EASY TO READ DIAL
SINGLE LEVER FEED SELECTOR 18 DIFFERENT FEEDS AT THE OPERATOR'S FINGERTIPS
SIX WAY RAPID TRAVERSE FROM FRONT OR REAR
LARGE EASY TO READ DIALS
VANNORMAN
NO 3

Conveniently Grouped, Easy to Reach Controls Speed Output on Van Norman Millers

All operating controls on Van Norman milling machines, such as front and rear directional power feed controls and six-way rapid traverse . . . single lever speed and feed selectors . . . spindle reverse selector . . . spindle clutch lever . . . are readily accessible and easily reached at all times by the operator. The result—increased work accuracy, greater output, and reduced worker fatigue.

Van Norman Millers are available in many models and sizes—Ram type Universal millers for all purpose milling operations . . . Horizontal millers . . . Vertical millers . . . Production millers . . . Contour millers . . . Hand mills—each designed to provide fast, accurate milling with the utmost ease of operation.

Van Norman Machine Tool Co.

SPRINGFIELD, MASSACHUSETTS

IT PAYS TO

Tooth Section of Van Normanized Gear

Material	plain carbon steel
Hardened to	55-57 Rockwell C
Depth hardened	.035—.045
Heating time	15 Sec.
Quenching	8 Sec.

Total time for heating operation 23 Sec.

Gear Teeth Surface Hardened in 23 Seconds

with Van Norman Induction Heating

Previously, carburizing required hours to harden, draw, clean and lap the gear illustrated above. Now Van Norman Induction Heating hardens the teeth of the same gear to 55-57 Rockwell C in just 23 seconds. Warping and distortion are eliminated and no cleaning operations are necessary. Furthermore, since the operating cycle is entirely automatic, gear after gear is turned out with *identical* characteristics.

Obviously, *Van Normanizing* saves valuable work-hours, cuts costs and provides a hardened gear with superior performance qualities. Investigate the possibilities of Van Norman Induction Heating Units. Write for Bulletin M15.

Van Norman Machine Tool Co.

SPRINGFIELD, MASSACHUSETTS

VAN NORMANIZE

LANDIS *Chaser Accuracy Is Maintained Throughout Its Life by the*

PERMANENT THROAT

12 Features of the LANDIS TANGENTIAL CHASER

1–Permanent throat permits close to shoulder threading throughout life of chasers
2–Rake angle range covers all machinable materials
3–Free cutting condition permits maximum cutting speeds
4–Simple grinding operation renews entire cutting edge and leading feature
5–Line contact with work lessens friction and minimizes thread distortion
6–Leading feature insures thread of accurate lead
7–Lateral absorption of cutting strain reduces vibration and chaser breakage
8–Right and lefthand threading feature reduces chaser equipment
9–Standard chasers thread all diameters with proper chaser holders
10–Interchangeability of chasers lowers operating cost
11–Chaser length provides exceptionally long life and low tool cost
12–Permanent throat gives equal distribution of cut

PERMANENT THROAT GIVES EQUAL DISTRIBUTION OF CUT

The throat is designed so as to enable the chasers to distribute the cut equally.

The initial accuracy of the chaser is maintained throughout its life. The cutting edge is renewed each time the chaser is reground, however no grinding is done on the throat or "lead" angle—it remains permanent and is not altered in any way.

The Finest Thread Cutting Tool in Industry

LANDIS
MACHINE COMPANY
WAYNESBORO, PA., U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

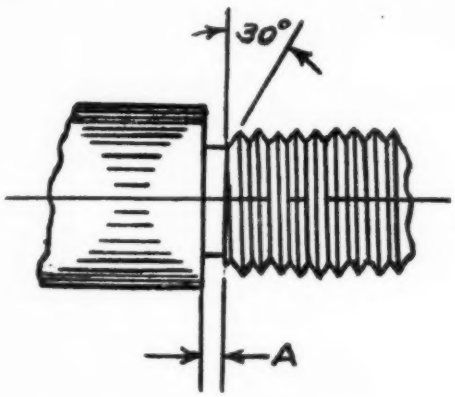
LANDIS REG. U.S. TRADE-MARK PAT. OFF.

THREAD TIPS

A Good Mechanic Knows and Cares For His Machine

In the Interest of Efficiency, Better Workmanship and Higher Production

BETTER THREAD QUALITY AND LOWER CHASER COST ASSURED BY USING LONGEST POSSIBLE CHASER THROAT



Recommended Widths of Under Cut
For Threads Cut With
Landis Chasers

THREADS PER INCH	"A" WIDTH OF UNDERCUT, INCHES			
	AMERICAN NATIONAL FORM		WHITWORTH	
	20° SHORT THROAT	30° SHORT THROAT	20° SHORT THROAT	30° SHORT THROAT
32	3/32	1/16	3/32	1/16
30	3/32	1/16		
28	3/32	5/64	3/32	5/64
27	3/32	5/64		
26	3/32	5/64	3/32	5/64
24	7/64	5/64	7/64	5/64
22			7/64	5/64
20	1/8	3/32	1/8	3/32
18	1/8	3/32	1/8	3/32
16	9/64	7/64	9/64	7/64
14	5/32	7/64	5/32	7/64
13	11/64	1/8		
12	3/16	1/8	11/64	1/8
11 1/2	3/16	1/8		
11	13/64	9/64	3/16	9/64
10	13/64	9/64	13/64	9/64
9	15/64	5/32	15/64	5/32
8	1/4	11/64	1/4	11/64
7	9/32	3/16	9/32	3/16
6	21/64	7/32	21/64	7/32
5 1/2	23/64	15/64		
5	25/64	1/4	25/64	1/4
4 1/2	7/16	9/32	27/64	9/32
4	31/64	5/16	15/32	5/16
3 1/2	35/64	23/64	17/32	23/64
3 1/4	37/64	3/8	37/64	3/8
3	5/8	13/32	5/8	13/32

The widths given are necessary to true out thread and allow nut to engage against shoulder. When work does not require undercut, the dimensions given equal the length of imperfect threads plus approx. 1/32".

Whenever possible a 20° throat should be used. The 20° throat is longer than the 30° throat thus dividing the chip over a longer cutting edge and producing a better finish on the thread. "A" dimension is 1/32 plus length of chaser throat.

Be Threadwise—Employ LANDIS Long Life Tangential Chasers

LANDIS MACHINE COMPANY
Waynesboro, Penna., U. S. A.

STANDARD
SUPER *Snap Gage*

With
SPHERICAL
Gaging Pins

that involve no condition of parallelism . . . .

YET PROVIDE *greater* ACCURACY IN PRECISION INSPECTION

*A new contact principle**
. . . . simple and practical

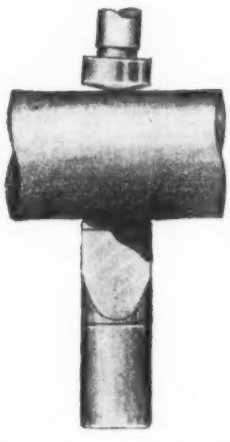
As mass production is accelerated, the need for faster, simpler, and *greater accuracy* of inspection becomes imperative. Snap gages are commonly used to control finer tolerances, but strain on the locking device distorts the frame thereby rendering the gage inaccurate. This distortion tilts the flat surfaced pins a few .0001" throwing them out-of-parallel to the common anvil, an important factor when tolerances are measured in .0001".

The STANDARD Super Snap Gage with its SPHERICAL gaging pins eliminates out-of-parallelism. This new spherical-contact principle involves no condition of sustained parallelism. The SUPER Snap Gage is easily set, requiring no simultaneous adjustment to a given dimension and to parallelism. It simplifies inspection, assures greater accuracy, and speeds production and inspection.

The return of out-of-parallel snap gages for correction is eliminated. Only pins and anvils need be held in reserve, instead of complete gages. The initial cost of the SUPER Snap Gage is no more. Pins are available as separate parts, to fit existing American Gage Design models.

(* Pat. Pending)

Conventional Snap Gage with flat surfaced gaging pins. The tilt is exaggerated to make the diagram clear. Note that only at their edges do the gaging surfaces contact the piece being gaged.

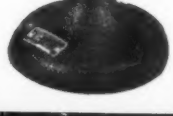


This illustration shows the Super Snap Gage with the pin shank at the same angle as in the diagram at the left. Note that the contact conditions are exactly the same as if the pin were not tilted.

Send for Illustrated Folder

STANDARD GAGE CO., Inc.
Poughkeepsie, N. Y.

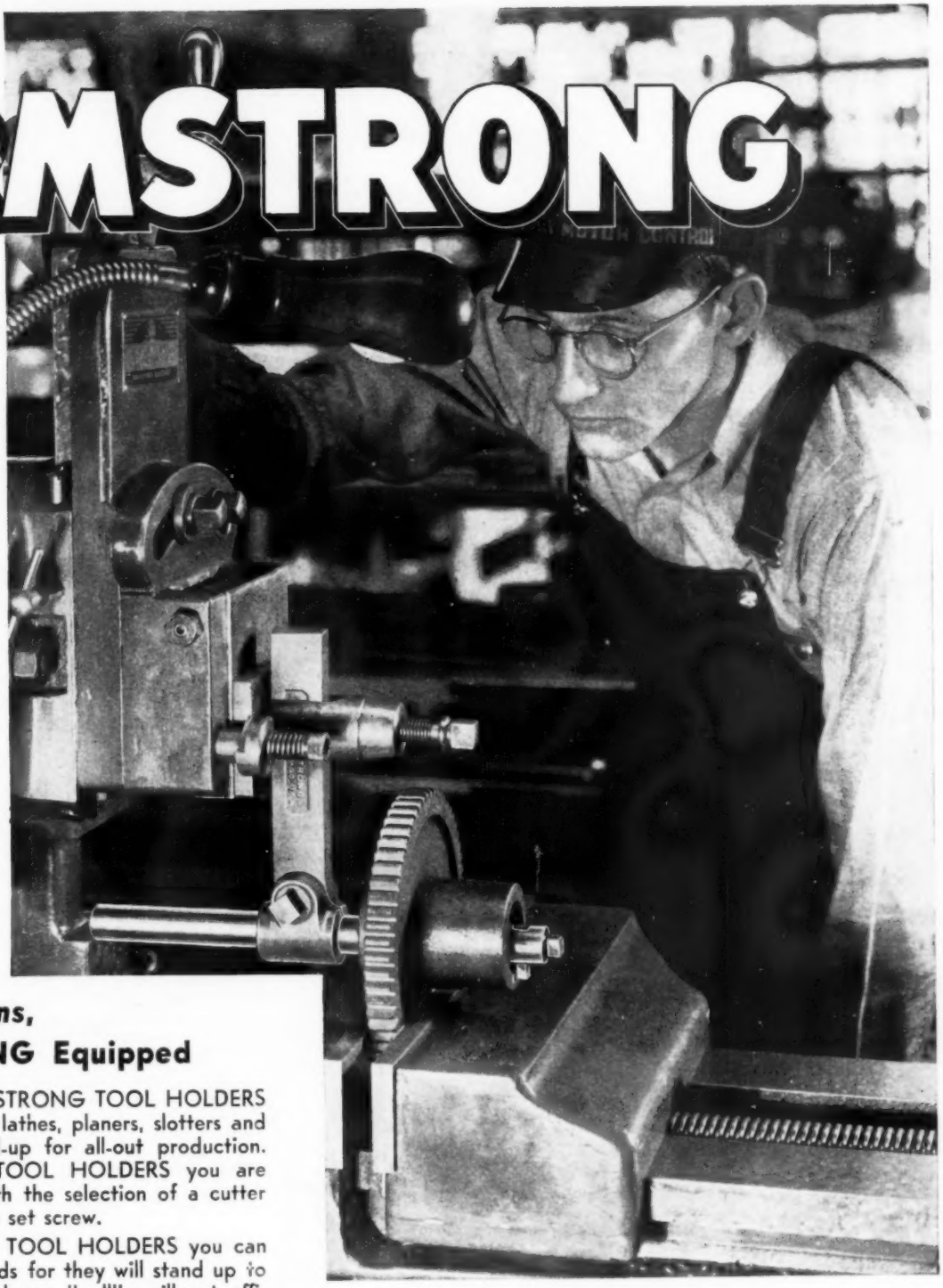
•
IMMEDIATE DELIVERY from stock
•



This illustration sho
Super Snap Gage mo
in a bench stand fo
venience in checking

MASTER CRAFTSMEN MANUFACTURING precision GAGES AND INSTRUMENTS

ARMSTRONG



"All-out" means,
All ARMSTRONG Equipped

With the correct ARMSTRONG TOOL HOLDERS for every operation on lathes, planers, slotters and shapers you are tooled-up for all-out production. With ARMSTRONG TOOL HOLDERS you are ready to start work with the selection of a cutter and the tightening of a set screw.

With ARMSTRONG TOOL HOLDERS you can step-up speeds and feeds for they will stand up to any cut a machine tool can "pull"—will cut efficiently at speeds and feeds far above those generally practiced as "standard."

With ARMSTRONG TOOL HOLDERS you will reduce the high speed steel requirements for any operation 90%—for in an ARMSTRONG TOOL HOLDER an ounce of high speed steel will do the work requiring 10 ounces in a forged tool.

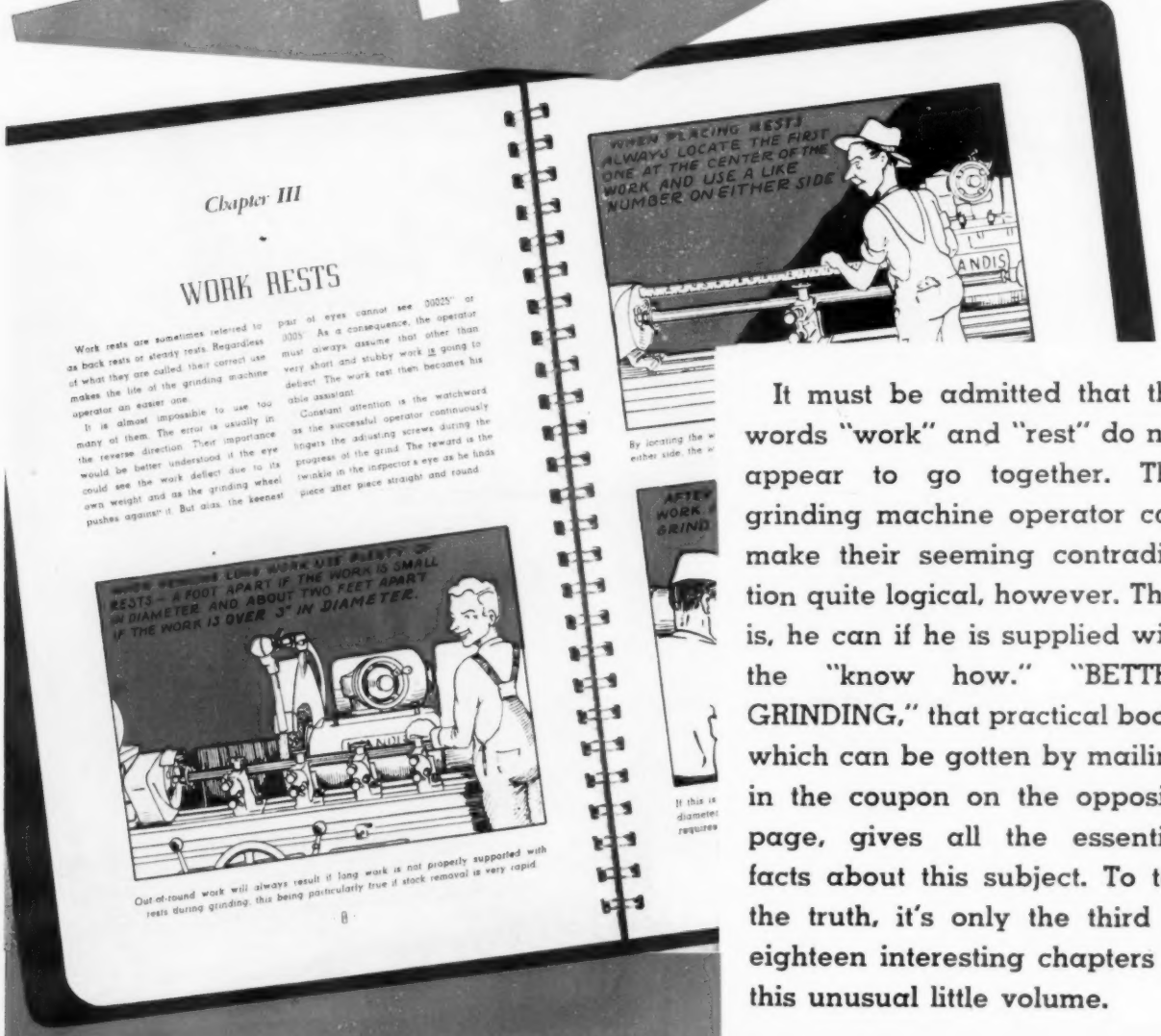
With ARMSTRONG TOOL HOLDERS you will be tooled-up "for the duration" and for the change-over to peacetime production after the war because each is a *permanent multi-purpose* tool—a basic tool wherever metal is to be machined.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. FRANCISCO AVE. CHICAGO, U.S.A.

Eastern Warehouse and Sales:
199 Lafayette St., New York

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

IT'S ALL HERE


Chapter III
WORK RESTS
Work rests are sometimes referred to as back rests or steady rests. Regardless of what they are called their correct use makes the life of the grinding machine operator an easier one.
It is almost impossible to use too many of them. The error is usually in the reverse direction. Their importance would be better understood if the eye could see the work deflect due to its own weight and as the grinding wheel pushes against it. But alas, the keenest pair of eyes cannot see .0002½" or .0005". As a consequence, the operator must always assume that other than very short and stubby work is going to deflect. The work rest then becomes his able assistant.
Constant attention is the watchword as the successful operator continuously fingers the adjusting screws during the progress of the grind. The reward is the twinkle in the inspector's eye as he finds piece after piece straight and round.
RESTS — A FOOT APART IF THE WORK IS SMALL IN DIAMETER AND ABOUT TWO FEET APART IF THE WORK IS OVER 3" IN DIAMETER.
Out-of-round work will always result if long work is not properly supported with rests during grinding, this being particularly true if stock removal is very rapid.
8
WHEN PLACING RESTS ALWAYS LOCATE THE FIRST ONE AT THE CENTER OF THE WORK AND USE A LIKE NUMBER ON EITHER SIDE
LANDIS
AFTER WORK GRIND

It must be admitted that the words "work" and "rest" do not appear to go together. The grinding machine operator can make their seeming contradiction quite logical, however. That is, he can if he is supplied with the "know how." "BETTER GRINDING," that practical book, which can be gotten by mailing in the coupon on the opposite page, gives all the essential facts about this subject. To tell the truth, it's only the third of eighteen interesting chapters in this unusual little volume.

THE CHAPTERS

Work Centers and Centers in the Work . . Work Drivers and Driving Dogs . . Work Rests . . The Diamond . . Wheel Dressing and Wheel Truing . . Mounting and Balancing the Wheel . . Grinding Wheel Coolant . . Lubrication . . Multiple V Belt Drives . . Wheel Spindles and Bearings . . Grinding Wheel Feed . . Grinding Wheel Width . . Speed of Work Carriage Traversal . . Work Speed . . Grinding Wheel Speed . . The Grinding Wheel . . Chatter . . Miscellaneous Bits.

Please Send Me a Free Copy of . . .

"BETTER GRINDING"

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ NO. 3

Please Print Above and Send To

LANDIS TOOL CO.

WAYNESBORO, PENNSYLVANIA

George Grindit Says

"Work rests are one of those things you just can't use too many of. Some folks call them back rests, some steady rests but regardless of the handle you place in front of the word "rests" their proper use is a blessing, while their absence is a curse. Them's strong words, you say. So they are. But he who wishes to be an expert grinder operator will not rest until he has mastered the mysteries of work rests."

THE LANDIS 10" x 24" TYPE C HYDRAULIC UNIVERSAL GRINDER

- Recommended for miscellaneous small lot production grinding and for certain tool room work handled in the larger quantities.
- Used by a vast number of war industries where the requirement is for a machine suitable for between center, internal and face grinding operations.

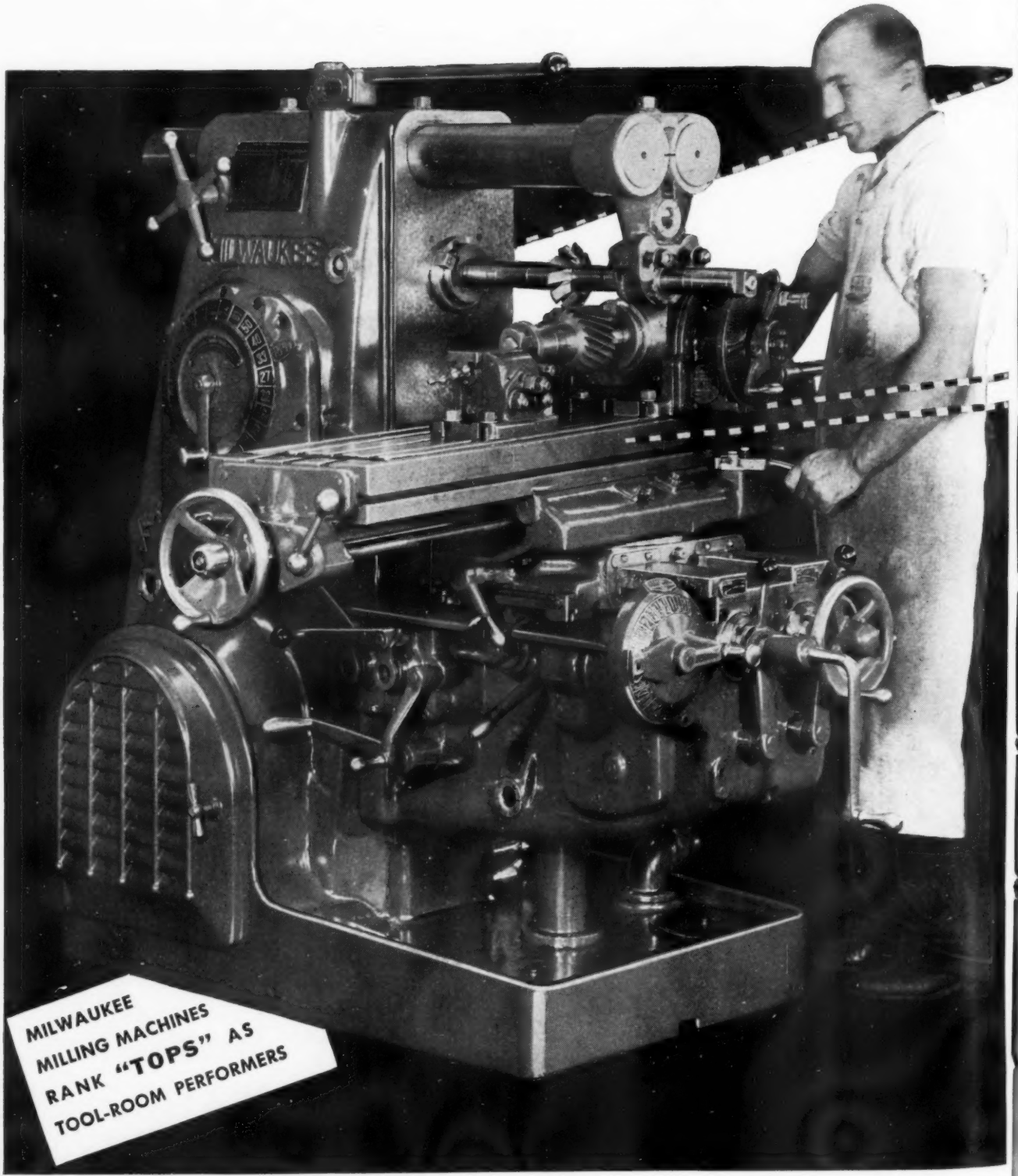
IF YOU HAVE A GRINDING PROBLEM

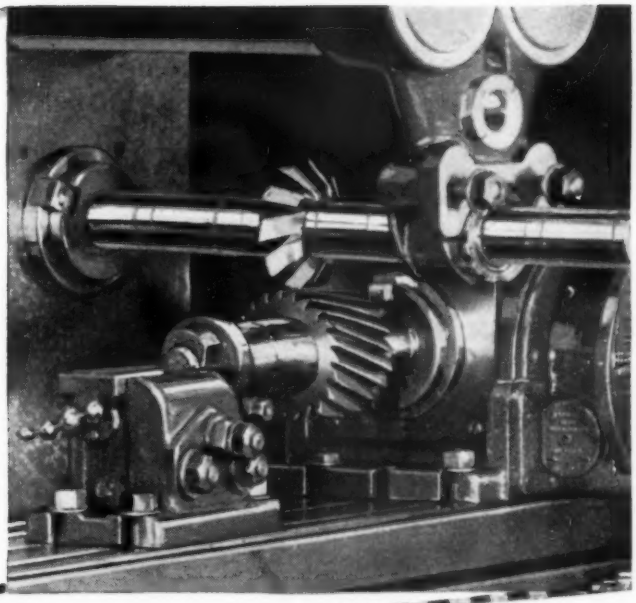
Let George do it

LANDIS TOOL CO. WAYNESBORO PENNSYLVANIA

IN YOUR TOOL ROOM

. . . Do A Greater Variety of Jobs — Faster — Without Special Equipment — With "Milwaukee" Universals





Only four hours to replace a critically important milling cutter which was broken in production and no replacement cutter available — here is another instance of Milwaukee Model K Universal Milling Machine flexibility and adaptability in the tool room.

This spiral slab milling cutter — 4½-inch diameter with a 15° helical angle and 24 teeth — was milled with a form cutter on a Number 2K Universal Milwaukee, with the aid of a 10″ spiral Universal Hypoid Dividing Head (5 to 1 index ratio). The low lead attachment (with more than 40,000 leads available) on this universal machine permitted quick, correct lead selection for the job.

Milwaukee Universal Milling Machines have won top-ranking preference in the tool rooms of America.

"BUY VICTORY WITH AT LEAST 10% IN WAR BONDS"

KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WISCONSIN

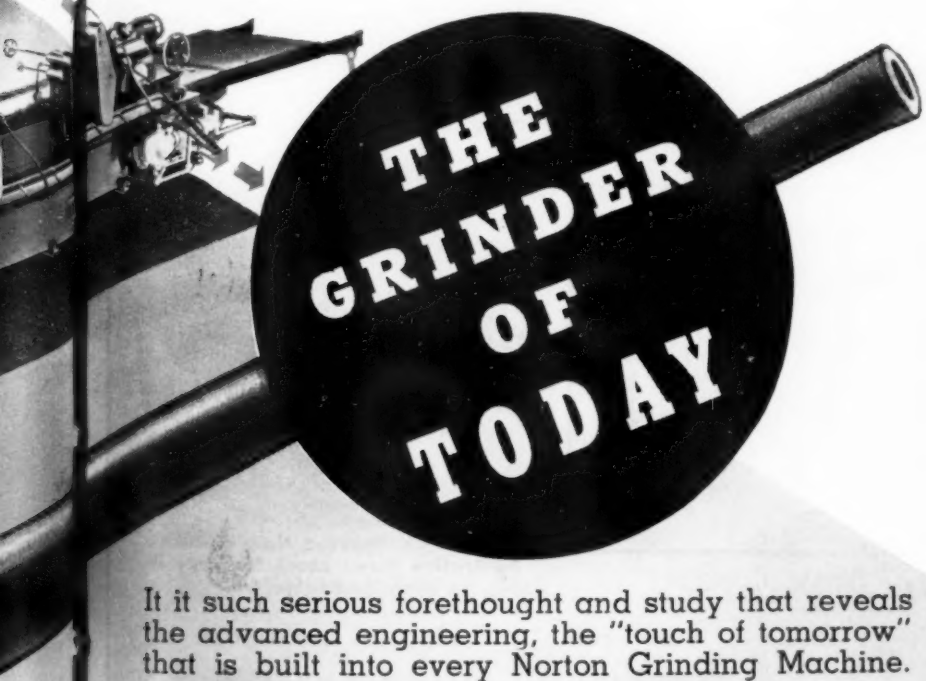
Milwaukee **MACHINE TOOLS**

GRINDERGRAMS

Always balance the grinding wheel. Precision work and fine surface finished cannot be obtained consistently with an unbalanced wheel. Unbalance will also set up unwanted vibrations in the grinding machine which may show up as chatter marks in the ground surface.

IMMENSE Norton machines today grind naval railway and coastal defense rifles of unprecedented calibers.* Tomorrow, when we turn from creating destructive weapons, these same Norton grinders can be quickly and easily converted from heavy ordance production to finishing crowned rolls for our steel and non-ferrous mills.

Adaptability and versatility are built-in characteristics of Norton machines. The big ordnance grinders are today constructed with finished surfaces and clearances for tomorrow's attachment of roll forming mechanisms. In like manner present-day grinding machine improvements are Norton-engineered for application also to machines now in the field so they, too, may have a prolonged life of increased usefulness.



It it such serious forethought and study that reveals the advanced engineering, the "touch of tomorrow" that is built into every Norton Grinding Machine.

* While wartime censorship forbids details of calibers, we have built numbers of large grinders for various United Nations governments ranging up to 40 feet between centers. We are today building the world's largest machine tool, a 36" by 816" (68 feet) plain grinder.

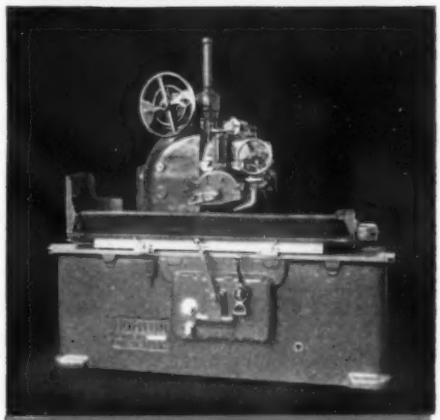
NORTON COMPANY, WORCESTER, MASS.

New York Chicago Detroit Cleveland Hartford

NORTON MACHINES

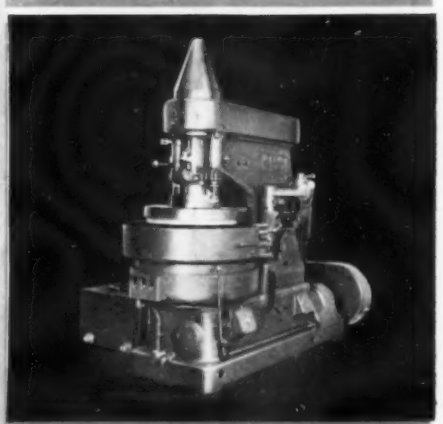
• GRINDING and LAPPING •

CYLINDRICAL



SURFACE

TOOL and CUTTER



LAPPING

Horton chucks

INDEPENDENT Solid Reversible Jaws Only

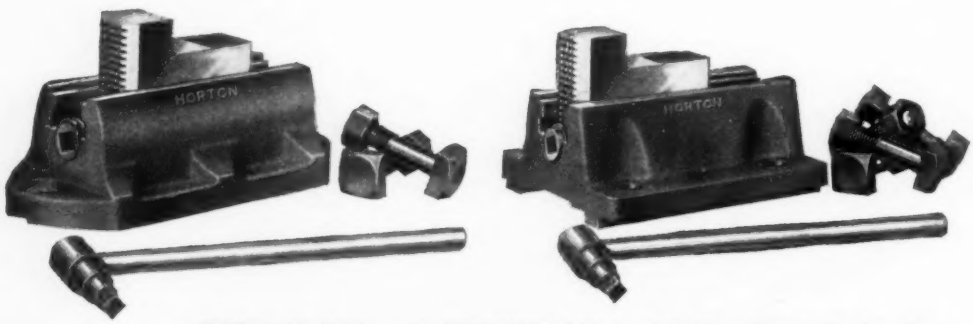
SCROLL UNIVERSAL Two-Piece Jaws Only

For Use With Intermediate Plates On Threaded Spindles

For Key Drive Tapered Nose Spindles

War Production Limited To These Essential Chucks

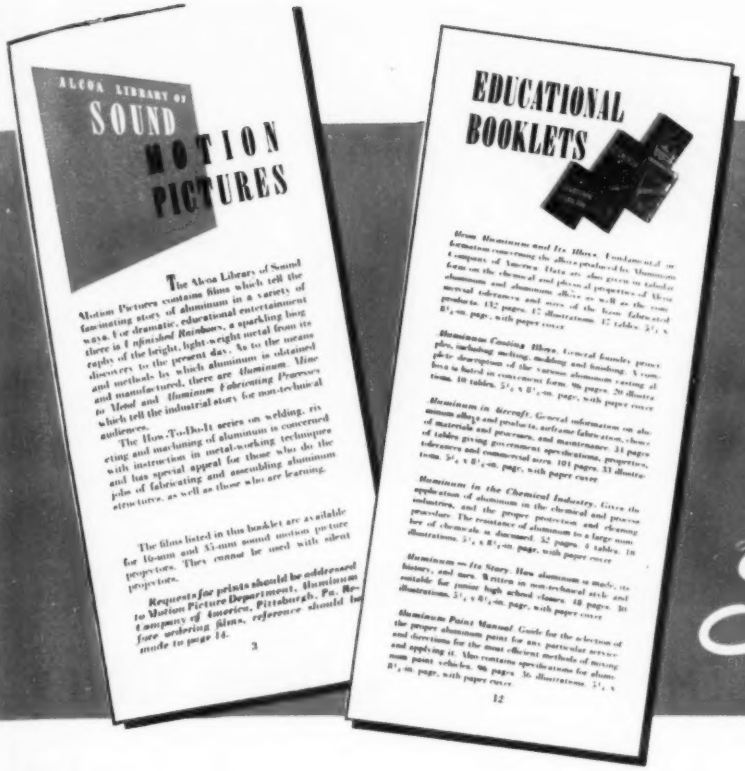
For Flanged Tapered Nose Spindles
Illustration shows chuck for Type D (Cam Lock) Spindle



FACE PLATE and BORING MILL JAWS—Steel Body Only

HORTON
MORROW

SINCE 1851 ....THE E. HORTON & SON CO.
WINDSOR LOCKS, CONNECTICUT, U. S. A.



ALCOA DIRECTS THIS MESSAGE TO *Subcontractors*

Are you one of the many companies who are working on airplane subcontracts? It may be the first time you've worked with aluminum, and the job is strange to your workmen. You have received materials and specifications from your prime contractor, but you may need detailed information on some particular phase of the fabricating work.

Aluminum Company of America has prepared both literature and task-instruction motion pictures which are available to you. Often, this material will answer your questions adequately. In some cases, however, you may require help on specific problems.

Alcoa engineers have spent a lifetime developing the best methods for fabricating aluminum alloys. Perhaps we've already helped some airplane builder solve the very problem that has you stymied. We're anxious to pass on all such information as will speed the war effort. Or, if it's a brand-new problem, we're ready to get going on that, too.

A letter or telephone call will start help on its way to you. Contact ALUMINUM COMPANY OF AMERICA, 2107 Gulf Bldg., Pittsburgh, Pennsylvania.

ALCOA ALUMINUM

GE Electronics REVOLUTIONIZES VARIABLE

New G-E THY-MO-TROL Drive Gives You Full-range, Stepless Speed Control

● *D-C ADVANTAGES FROM A-C POWER*

Complete Drive — Nothing Else to Buy. Thy-mo-trol drive is a complete equipment operating its d-c motor from your a-c power line. Starts, accelerates, controls speed, stops by dynamic braking, and reverses the motor—all from a single, compact, control station. And it fully protects the motor.

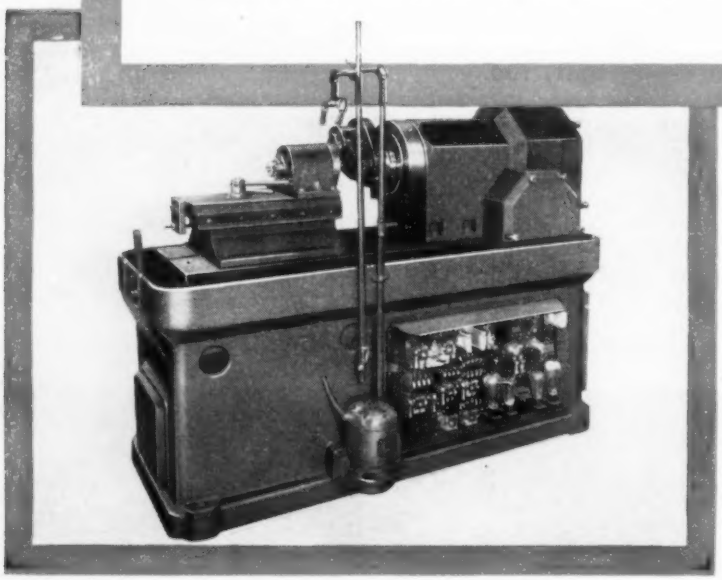
Makes available previously unused advantages of d-c motors, such as:

1. Full-range, Stepless Speed Control. A single dial—small as a radio volume control, and mounted in the push-button control station—gives complete adjustment of motor speed, from zero to maximum, *without steps*. No belts, gears, or clutches needed to change speed. Gives you the exact speed you want, whether it be for roughing or fine finishing.

2. Holds Speed under Changing Load. Regardless of load fluctuations—if they're within the power range of the drive—Thy-mo-trol electronic circuits hold speed constant within extremely narrow limits. With Thy-mo-trol drive you get both full speed-range and a flat speed-load characteristic.

3. Full Torque at Low Speeds. Though the motor may be scarcely turning over, it will deliver *full torque* right up to the stall point! That means greater output than with other drives. And the motor is fully protected at all times.

4. Current-limit Acceleration. Regardless of the speed-control setting when the START button is pushed, Thy-mo-trol acceleration is smooth because of electronic current limiting. Yet you get fastest possible starting because of sustained maximum torque during acceleration. No shock to your machine due to sudden



Already — Operating Results!

Thy-mo-trol drive—built into this planetary milling machine made by Plan-O-Mill Corporation—provides automatic cyclic control of feed-in, feed-around, and rapid reverse, each at a different preset speed. Plan-O-Mill engineers selected Thy-mo-trol drive for its compactness, stepless speed control, low cost, and simplicity. They have found that tool life is greatly lengthened by using correct speeds for each operation, and by being able to start the tool at low speed with full torque.

SPEED DRIVE!

FULL CONTROL with a SINGLE DIAL

application of excessive torque. No current peaks on the line.

Dozens of Other Thy-mo-trol Extras . . . such as: low maintenance (by elimination of moving parts); speed can be preset before starting; saves space; no stop for speed change; easy to control automatically; operates direct from a-c line—no motor-generator or other special d-c supply needed.

Where Has It Been Applied? Drill presses, to increase speed range and size of work handled. Grinders, for precise speed selection and improved finish. Milling machines, to increase range of work handled, and to simplify design. Propeller testing, for accurate, smooth speed control. Cable reelers, to maintain constant tension. Conveyors, to match speeds.

How to Buy Thy-mo-trol Drive. Because *electronic* motor control offers so many advantages through improved machine design, performance, and operating technique, G-E engineers want to consider each of *your* problems as an individual case. Standard Thy-mo-trol drives can be obtained in sizes up to 10 hp. Special types can also be provided. For further information write, stating your problem, to any G-E office, or to Electronic Control Section, General Electric, Schenectady, N. Y.

Another FIRST in Industrial Electronics by

GENERAL ELECTRIC

Safeguard Production · Reduce Rejections · ·
Avoid Delays · *Assure Interchangeable Work* · · ·
At low Cost with the
SCHERR INSPECTION UNIT

● This complete, combination Inspection Unit has been developed to meet today's need for accuracy under top speed production demands—and it is available at a price within the reach of practically any war-busy shop. It will enable you to check all your plug gages, cylindrical ground work, pins, pivots, bearings, gage blocks, flat work of all kinds quickly and accurately. It is also available for a wide variety of other uses.

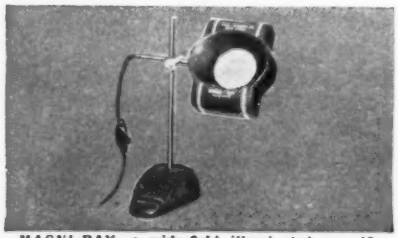
The SCHERR INSPECTION UNIT includes:

1. The Scherr Comparitol—a measuring instrument which makes it possible to check work at 1/10,000", .004" plus or minus.
2. A set of 34 gage blocks, which make up 80,000 combinations in steps of 1/10,000".
3. An Optical Flat for checking lapped surfaces.
4. A specially constructed gage case for holding gage blocks and other tools and gages and which serves also as a base for the Comparitol.

Scherr Inspection unit (without attachments). Price $395.00. (Attachments shown are available at extra cost)

Write for full and complete information

OTHER INSTRUMENTS IN THE SCHERR LIMITED BUDGET INSPECTION LABORATORY



MAGNI-RAY—a wide-field illuminated magnifier providing a means for close inspection of work and operations.

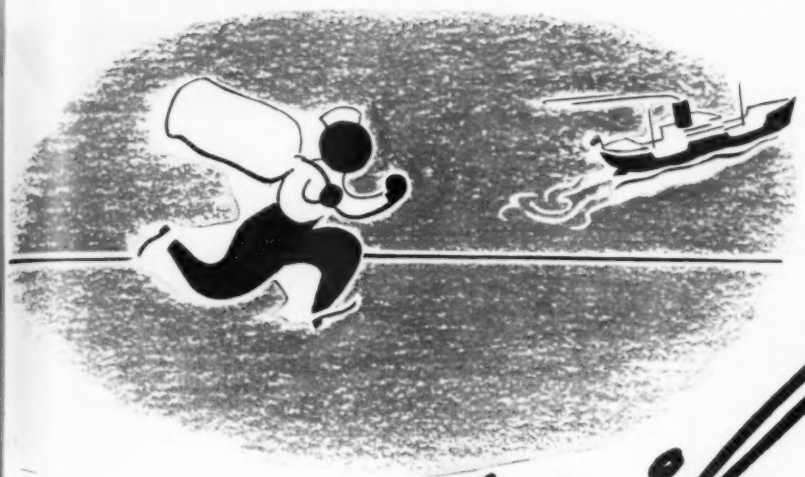
ATLANTIC ADJUSTABLE LIMIT SNAP GAGES provide accurate check-up without having to depend on operator's skill. Sizes to 6".

SPENCER BINOCULAR MICROSCOPE—providing 3-dimensional vision for detecting surface finish, imperfections, etc. not possible to see with one plane of vision.

★

WILDER PROJECTOR provides accurate measuring or comparison of objects by means of magnified shadow.

GEORGE SCHERR COMPANY, INC. 124 LAFAYETTE ST., NEW YORK, N.Y.



sailed ON TIME!

steamship turbine rebladed in 2 days

DELAY THREATENED IN DEPARTURE OF WAR MATERIEL BY BROKEN BLADES IN STEAMSHIP TURBINE. PROPER BLADES RELEASED ON PRIORITY, FLOWN TO PACIFIC COAST PORT. AT WESTINGHOUSE DISTRICT MANUFACTURING AND REPAIR PLANT, SPINDLE WAS CLEANED, REBLADED AT MIDNIGHT, BALANCED BY 4:00 A.M., DELIVERED TO SHIP AND INSTALLED FOR SHIP TO LEAVE ON SCHEDULE AT 8:00 A.M.

Westinghouse

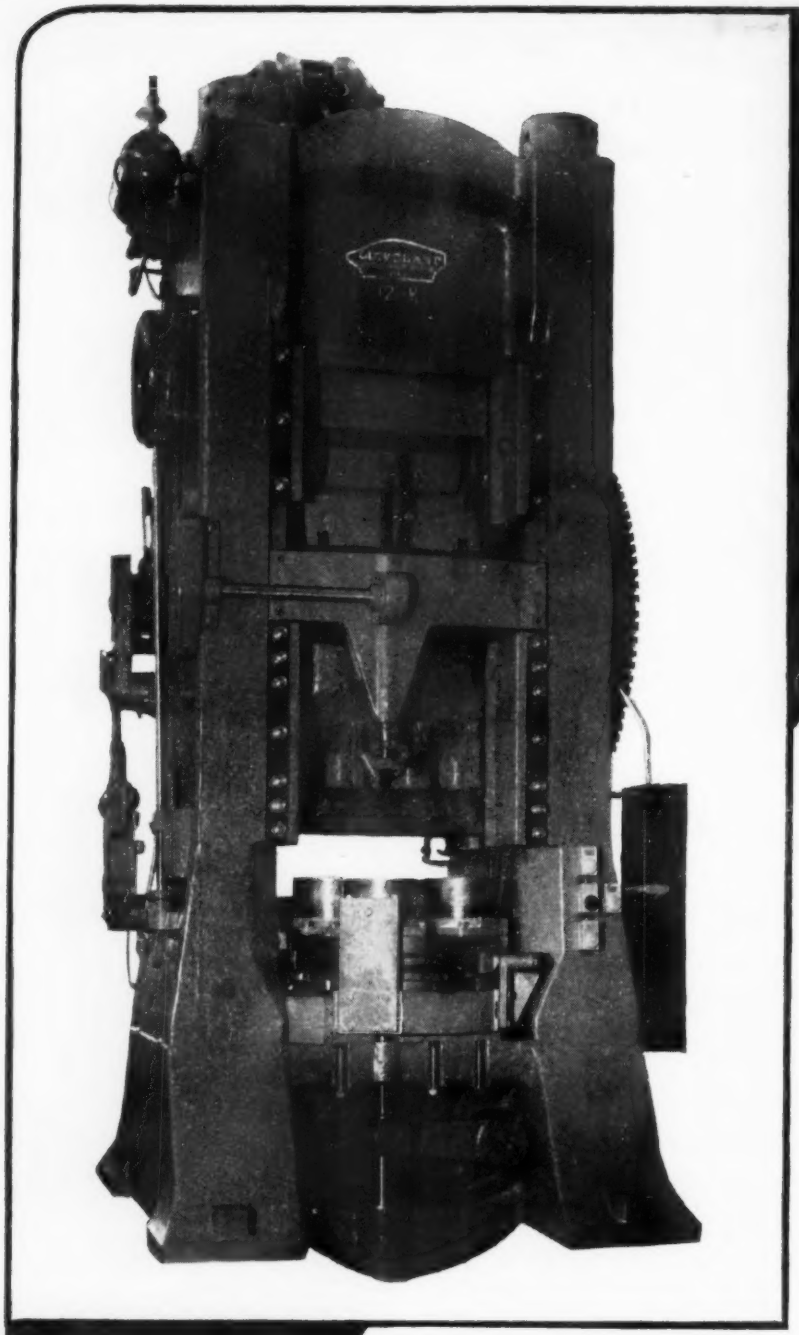
DISTRICT MANUFACTURING AND REPAIR

J-90466

IF **THE EQUIPMENT NEEDING REPAIR IS VITAL TO THE WAR EFFORT . . . PHONE THE NEAREST OFFICE OF WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY FOR**

EMERGENCY SERVICE

33 M & R PLANTS . . . ONE NEAR YOU!



1200 TONS CAPACITY *for*

The change over from the manufacture of *brass* shell casings to *steel* casings, can usually be accomplished by adding some heavier Mechanical Presses to the line. Manufacturers interested can obtain full information by addressing our Engineering Department.

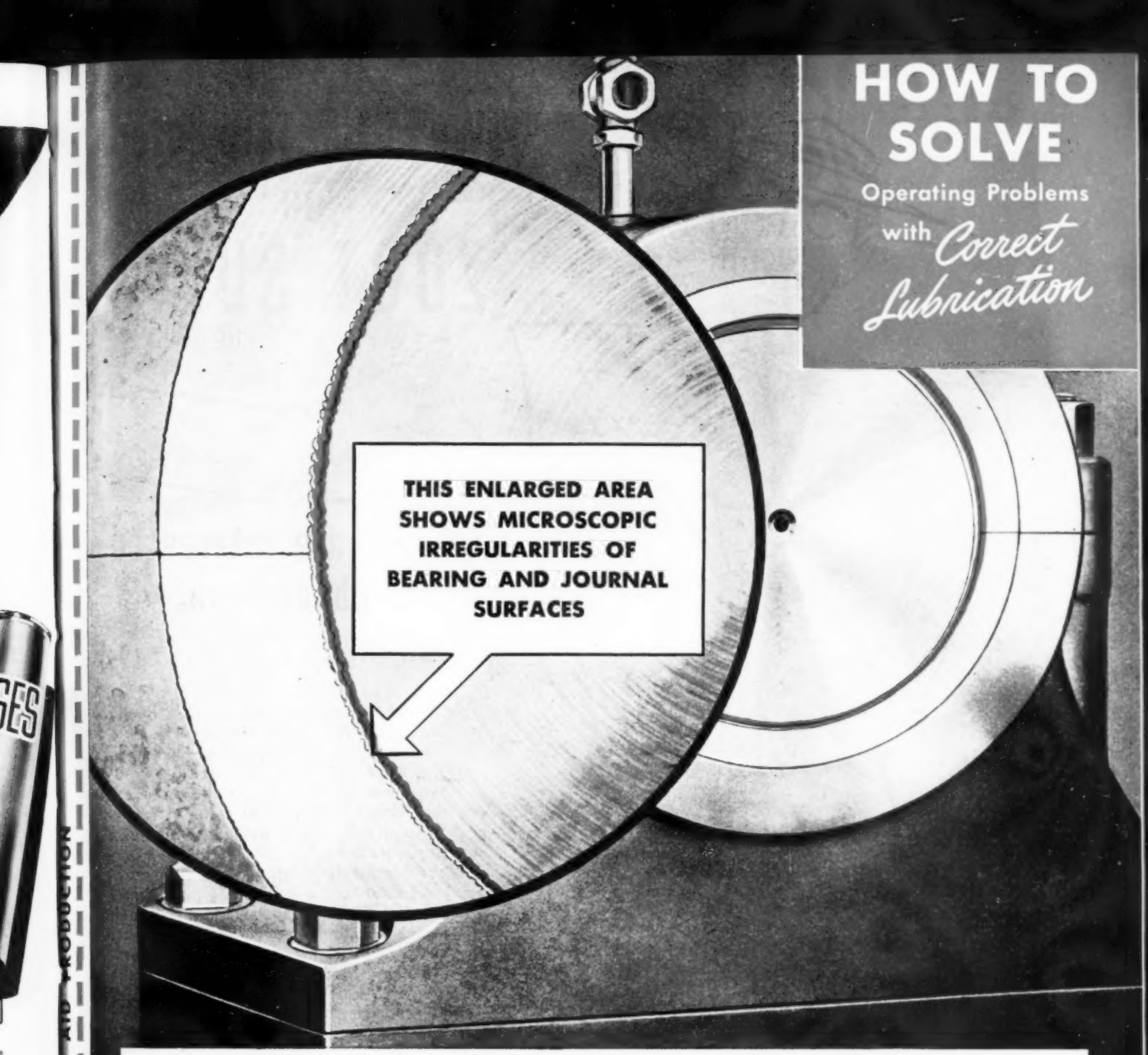
The Production of Steel Shell Cases...

There are several different types of Cleveland Power Presses used in the production of shell cases, each type being particularly suited to perform a given operation or series of operations such as heading, sizing, drawing, indenting, etc., efficiently and economically.

The Press illustrated above is used for heading 75 mm shells. It is arranged with an electrically controlled air operated friction clutch and brake and equipped with a five station automatic dial feed. The Press has a capacity of 1200 tons and operates at 20 strokes per minute.

Modern Presses **THE CLEVELAND PUNCH & SHEAR WORKS COMPANY** *Cleveland, Ohio*

NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • PITTSBURGH



HOW TO SOLVE

Operating Problems with *Correct Lubrication*

Keep Journals "Floating"

PROBLEM: That's a picture of a simple bearing and journal lubricated by a circulation system. See how their surfaces, so polished to the naked eye, are actually jagged hills and valleys under the microscope! Unless a thick film of oil separates these surfaces the irregularities tend to interlock, cause friction and excessive wear. When bearings are supplied with sufficient oil, rotation of the journal forms an oil wedge thick enough to *actually float the journal.* When deposits in the oil passages prevent adequate oil supply, the oil wedge is destroyed and excessive wear results — and that's the problem in a nutshell.

ANSWER: Gargoyle Vacuoline Oils are ideal for circulation-oiled machine bearings. They resist to a maximum the most severe deposit-forming influences and assure continuous oil flow to the bearing.

GARGOYLE

Lubricants

SOCONY-VACUUM OIL COMPANY, INC. — Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. White Eagle Div. • Wadhams Div. • Southeastern Div. (Baltimore) • Magnolia Petroleum Co. • General Petroleum Corp.

CALL IN SOCONY-VACUUM

We're not interested in ZOOT SUITS

but we are interested in the phenomena of change...

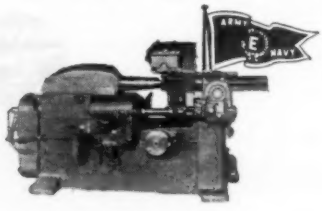
We're not rug cutters, and we're distinctly not "right with the rags." We don't wear a "solid suit of threads," padded at the shoulders like a lunatic's cell, with the "jut cuts" and the "reat pleats," the "cleave sleeves" and the "drape shape." That sartorial throwback of a juvenile ego is definitely not down our alley.

We're specialists in internal grinding problems, and Zoot suits (we fervently pray) won't wield their foolish influence upon the wheels of industry . . . but many a simple fad has!

When a boy and a girl once sat in a hammock, and he thrummed a mandolin and she softly sighed, "I just love your new soft collar" — the celluloid collar market quietly vanished from this earth . . . And the horse-and-buggy business employed a million men — until an explosive contraption, deplored as a dangerous fad, noisily disemployed them and put ten times their number to work.

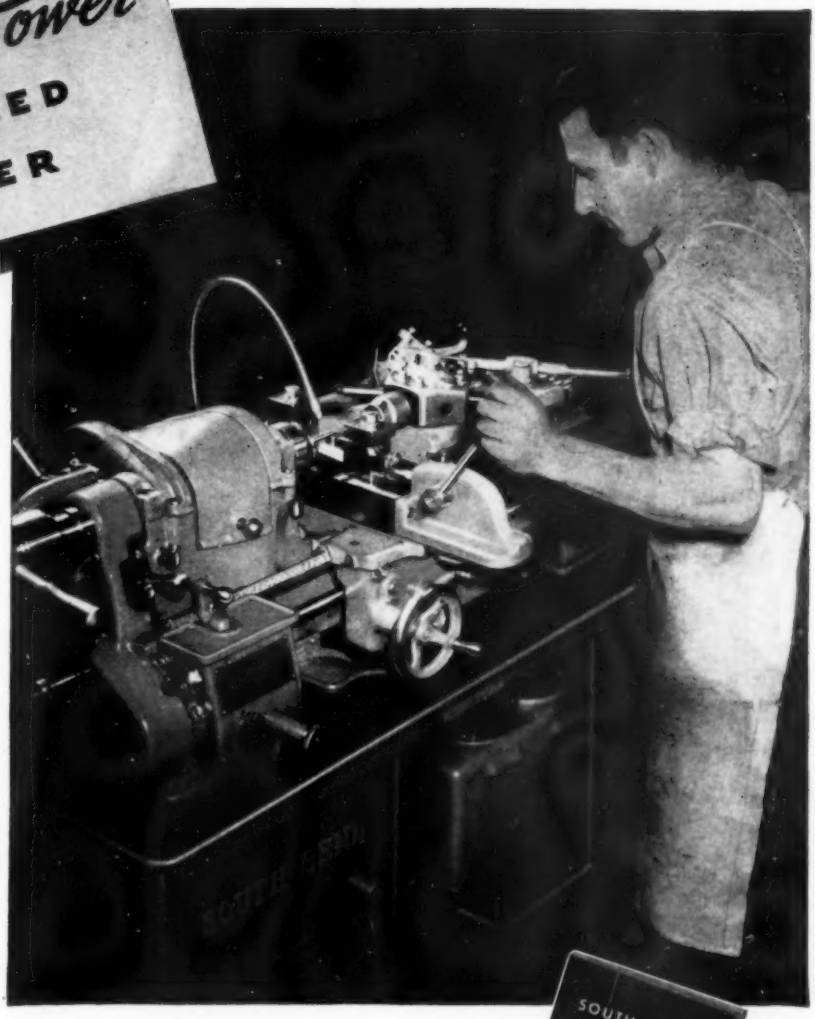
No, we're not interested in Zoot suits, but we are interested in the phenomena of change. And this is the fastest-changing period in all of industrial history. As a result, many businesses, seemingly on the rise, are actually on the brink of failure in the post-war world of better and cheaper materials.

We've developed many new techniques in grinding these materials, and we believe that this knowledge can be of greater value to manufacturers today than ever before. Bryant's Consulting Service is available to you at all times, and we urge you to call upon us now!



BRYANT CHUCKING GRINDER CO.
SPRINGFIELD, VERMONT, U. S. A.

MORE *Producing Power* FOR SKILLED MANPOWER



Skilled manpower is one of the most critical of all our strategic resources. To give our fighters the added striking power of more and better weapons, our skilled workers need the producing power of more efficient tools.

Machine tools that are inefficient because they are hard to operate, inaccurate, or incapable of delivering the required speeds are wasteful of critical manpower. Wasted manpower is lost production—and victory jeopardized!

Give your skilled manpower more producing power with South Bend Lathes. Designed and built to deliver maximum production with minimum effort, they are highly efficient on a wide variety of precision machine work. Their ease of operation reduces fatigue and seemingly shortens the workday by hours. This is accomplished through conveniently placed, smoothly operating controls—clear-cut, easy reading graduations—fully enclosed design with no exposed pulleys, belts, or gears—and dependable precision that permits top speed production, even when tolerances must be held to extremely close limits.

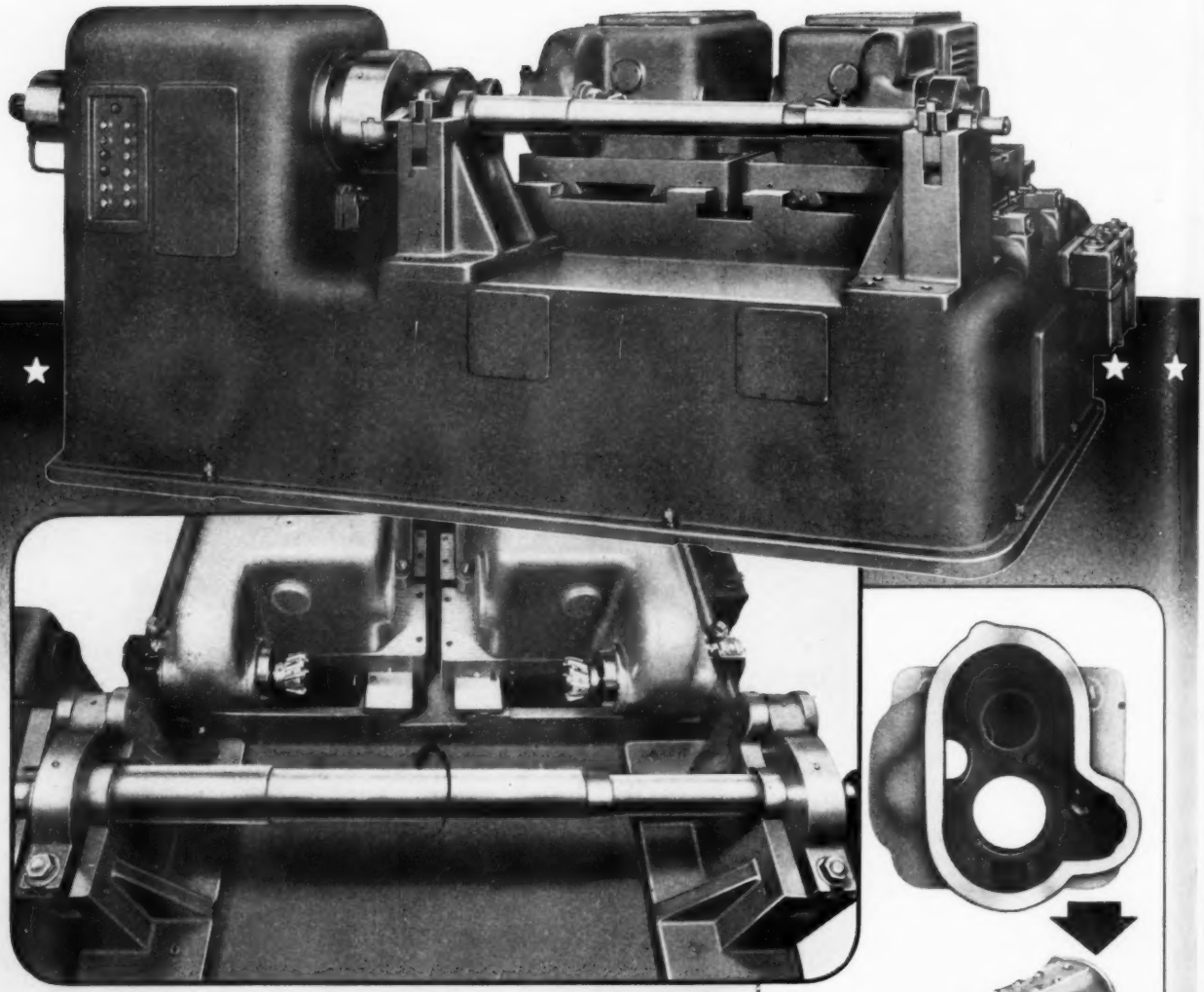
SOUTH BEND LATHE CATALOG

The entire line of South Bend Lathes is described in Catalog 100C. Write for your copy of this new 48 page catalog.

Army — Navy Production Award with Star presented to the South Bend Lathe Works for outstanding war production.

SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 36 YEARS
SOUTH BEND, INDIANA

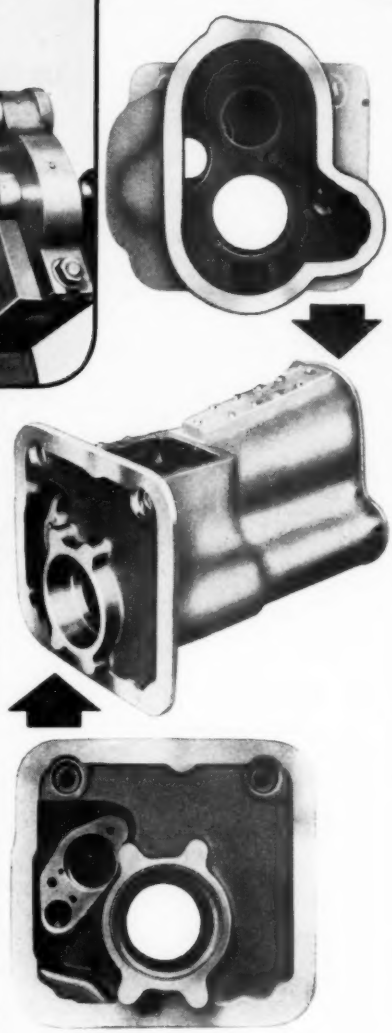


CROSS DESIGNS AND BUILDS

Special Machinery

Solving this unusual and difficult manufacturing problem has attracted the widespread attention of production engineers. The work is mounted on an arbor and revolved at a feeding rate while both ends, although dissimilar in shape and contour, are milled simultaneously to assure exact parallelism and squareness with the bore. The automatic operating cycle is controlled from a centralized push button station and excellent results are secured with unskilled labor.

A review of your manufacturing practice will reveal many opportunities to consolidate operations and put them on an automatic basis with improved accuracy and reduced manpower. Cross engineers are prepared to assist you in applying special machinery to your manufacturing problems.



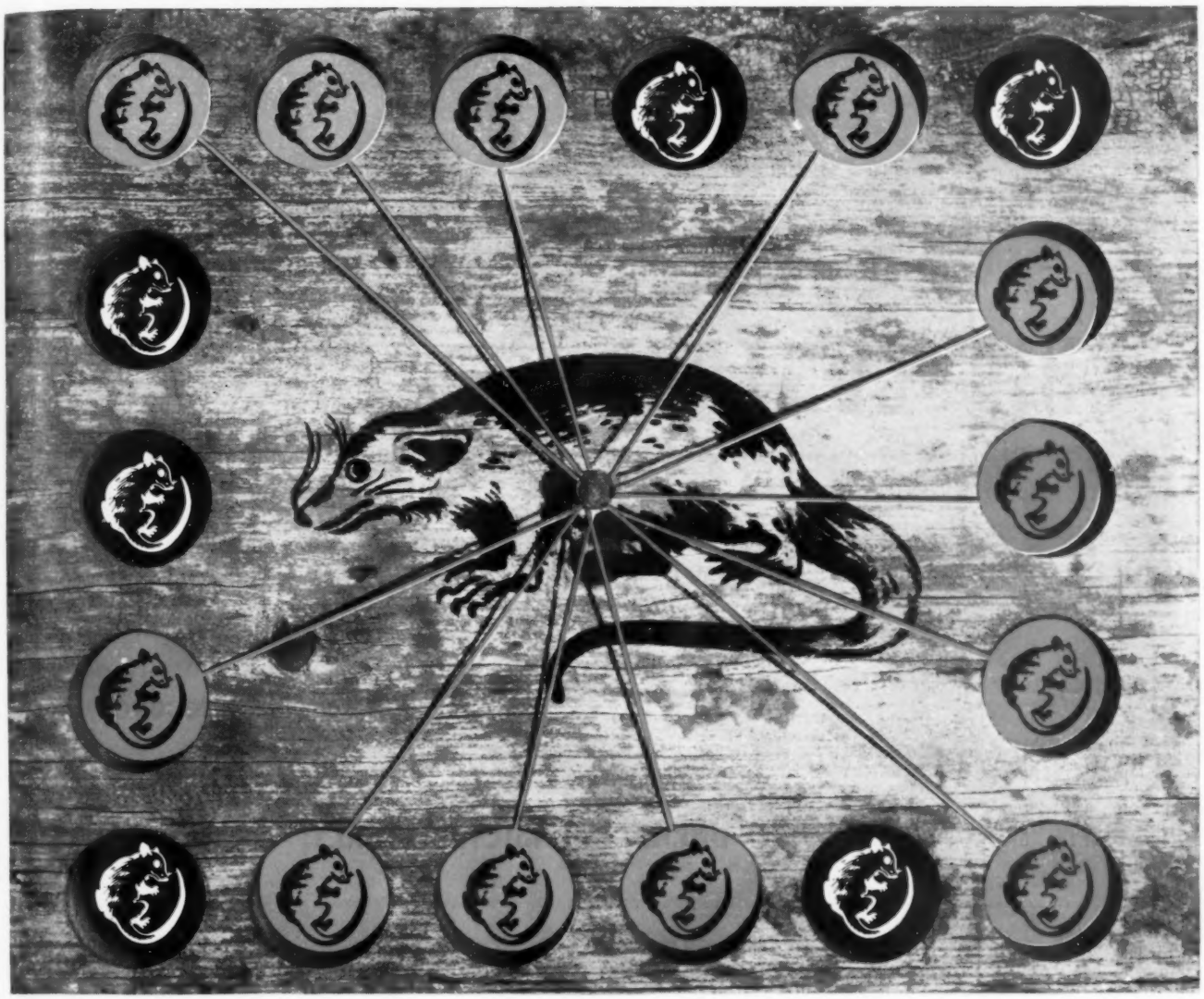
On the cast iron gear box illustrated above both ends, each entirely different from the other, are automatically finished at the same time and in one operation.

CROSS GEAR & MACHINE CO.

Established in 1898

DETROIT, MICHIGAN, U.S.A.

S-4



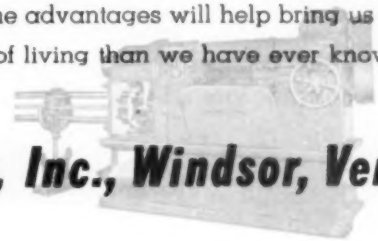
Nature's most tragic mistake

THE POSSUM'S LITTER consists of 18 babies. But mother possum can only accommodate 12. At birth, there's a mad scramble for the 12 nipples, and the first arrivals don't budge **for 6 weeks!** The other 6 babies just look on... and die of starvation.

What an ironic circumstance! A mother forced by fate to watch her own babies starve! And what a pointed illustration of the ruthlessness of Nature. In Nature and in business, the fight for survival is equally vital. Failure to keep abreast of changing conditions has invariably doomed the less alert industrials to business death.

Because they affect almost everything we touch, machine tools will be more necessary than ever in the post-war era. Machine tools are essential today to the output of the food you eat, the clothes you wear, your automobile, your vacuum cleaner, your washing machine, your refrigerator. Machine tools not only create new industries, but they create employment. They are largely responsible for our present way of life... unequalled by any other country in the world.

In our post-war era, Cone Automatic Multiple Spindle Lathes will be even more essential than they are now. Their unique advantages will help bring us all higher standards of living than we have ever known before.



CONE Automatic Machine Company, Inc., Windsor, Vermont

FIRTHITE

FIRTHITE

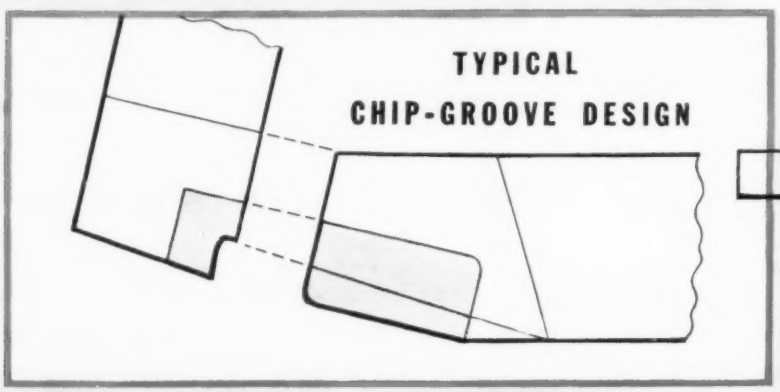
CHIP CONTROL

The rapid machining of **alloy steel** requires effective means of controlling chips. Long, hot, tough chips endanger the operator, make chip disposal difficult, reduce the value of scrap (by $2.00 a ton), cause tool breakage, and delay work.

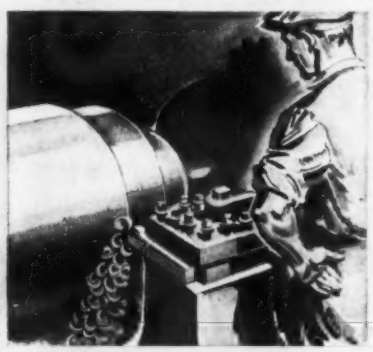
The remedy is properly designed chip breakers. Tools with chip breakers require a little more power but, where long chips are a problem, chip breakers are the answer.

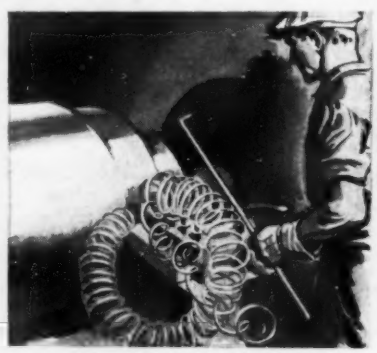
Aside from the safety factor, chips that can be **shovelled** are readily marketable as scrap, command a higher sale price per ton, and—most important to the war effort—speed the **recovery** of scarce and critical alloys.

HOW TO GRIND A CHIP BREAKER EASILY, QUICKLY, INEXPENSIVELY



A quick, simple method of designing and grinding chip breakers, as illustrated, is described on pages 41 to 43 of the FIRTHITE Users' Handbook . . . or, a FIRTHITE Engineer will gladly discuss chip control in your plant.





CHIP CONTROL WITH CHIP BREAKER VS. NO CONTROL WITHOUT CHIP BREAKER

Firth-Sterling
STEEL COMPANY

MAKERS OF FIRTHITE TUNGSTEN-TITANIUM CARBIDES FOR STEEL CUTTING

SHOWS HOW

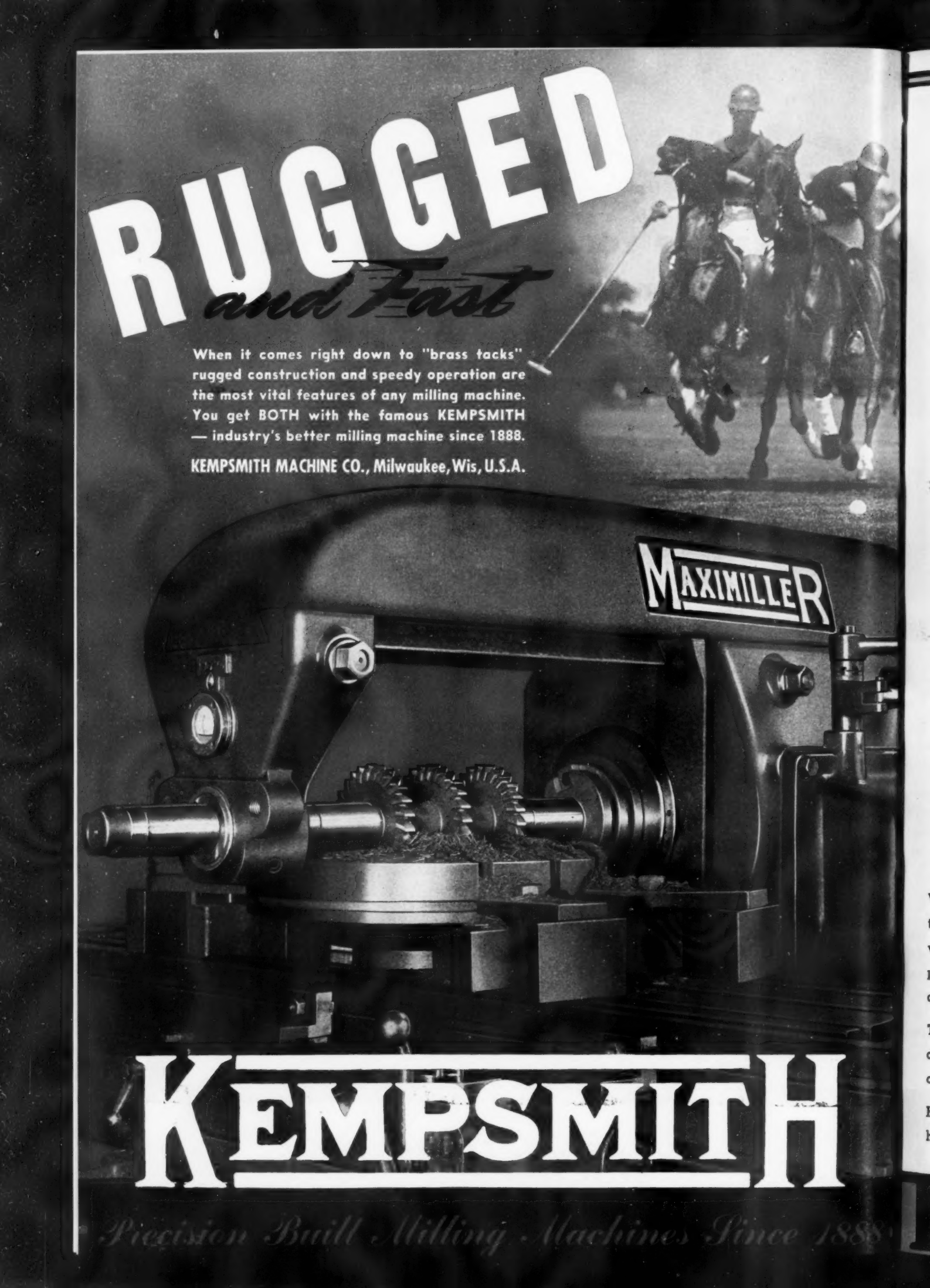
TO BREAK UP YOUR ALLOY-STEEL CHIPS AUTOMATICALLY...

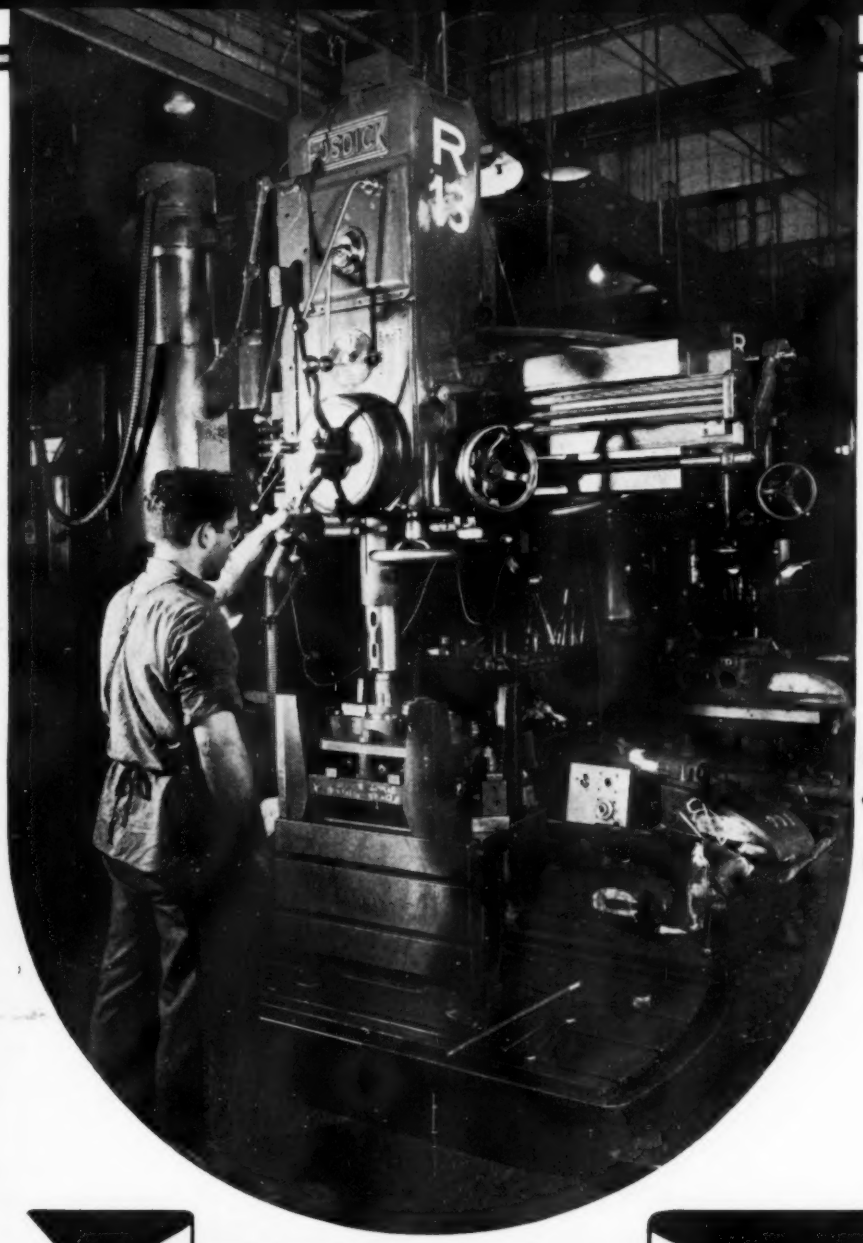
FOR SAFETY AND PROFIT

Firth-Sterling

STEEL COMPANY

Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA . CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES


RUGGED
and Fast
When it comes right down to "brass tacks" rugged construction and speedy operation are the most vital features of any milling machine. You get BOTH with the famous KEMPSMITH — industry's better milling machine since 1888.
KEMPSMITH MACHINE CO., Milwaukee, Wis, U.S.A.
MAXIMILLER
KEMPSMITH
Precision Built Milling Machines Since 1888



ARMY (E) NAVY

A Big Gun ON THE HOME FRONT

FOSDICK *Hydraulic* RADIAL

With production targets being raised constantly to provide ample equipment and materials for our various fighting fronts every machine tool must produce at full capacity—24 hours a day—7 days a week to maintain vital production.

The Fosdick Radial shown is typical of the hundreds of these machines at work in plants throughout the nation.

Here the machine is drilling and counterboring 4 holes 2.834 inch diameter—maintaining limits of .0002 inch. Other operations include drilling and reaming one 5/8" hole, drilling 6—2 9/64" holes, boring 6—41/64" holes, drill and ream 2—.498" holes, drill and tap 1—3/8" hole.

Thus this versatile, easy to operate machine is meeting constantly increased demands for production and accuracy on a wide range of operations for our "all out" war effort.

Investigate a Fosdick for your drilling, reaming, boring and similar operations. Complete information in Radial Bulletin R.A. Write for one.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI · · · OHIO

"We could lose this War between 5 p.m. and 7 a.m."

JOHN BLAZEK, the author of this remarkable statement, is the production manager of a war-material plant in a midwestern city.

"I'M no pessimist. But I'm telling you the hours between sunset and sunrise can be the most critical hours of this war. Not on the battlefronts, but in the factories and shops where they're making the things our boys must have to win the final victory.

"My factory has been working on important war contracts. Daytime production was as good as could be expected. But night production was 40% behind schedule. The employees worked just as hard. They seemed more tired than the day crew. But they weren't making the grade.

"I knew a dozen things might be wrong, but I had an idea one trouble might be the lighting. So I called in a lighting man and put it up to him.

"He made a careful study. Then he showed me what *was* wrong with the lighting, particularly as it affected the night workers. I was willing to try *anything* that might help, so we made the changes he recommended. Today, under the new improved lighting, our night shift workers are running neck and neck with the rest.

"I don't know how many other plants have been having this same trouble. But if production generally is lagging behind on the night shifts—those hours between 5:00 P. M. and 7:00 A. M.—*we could lose this war.* Unless we do something about it right away.

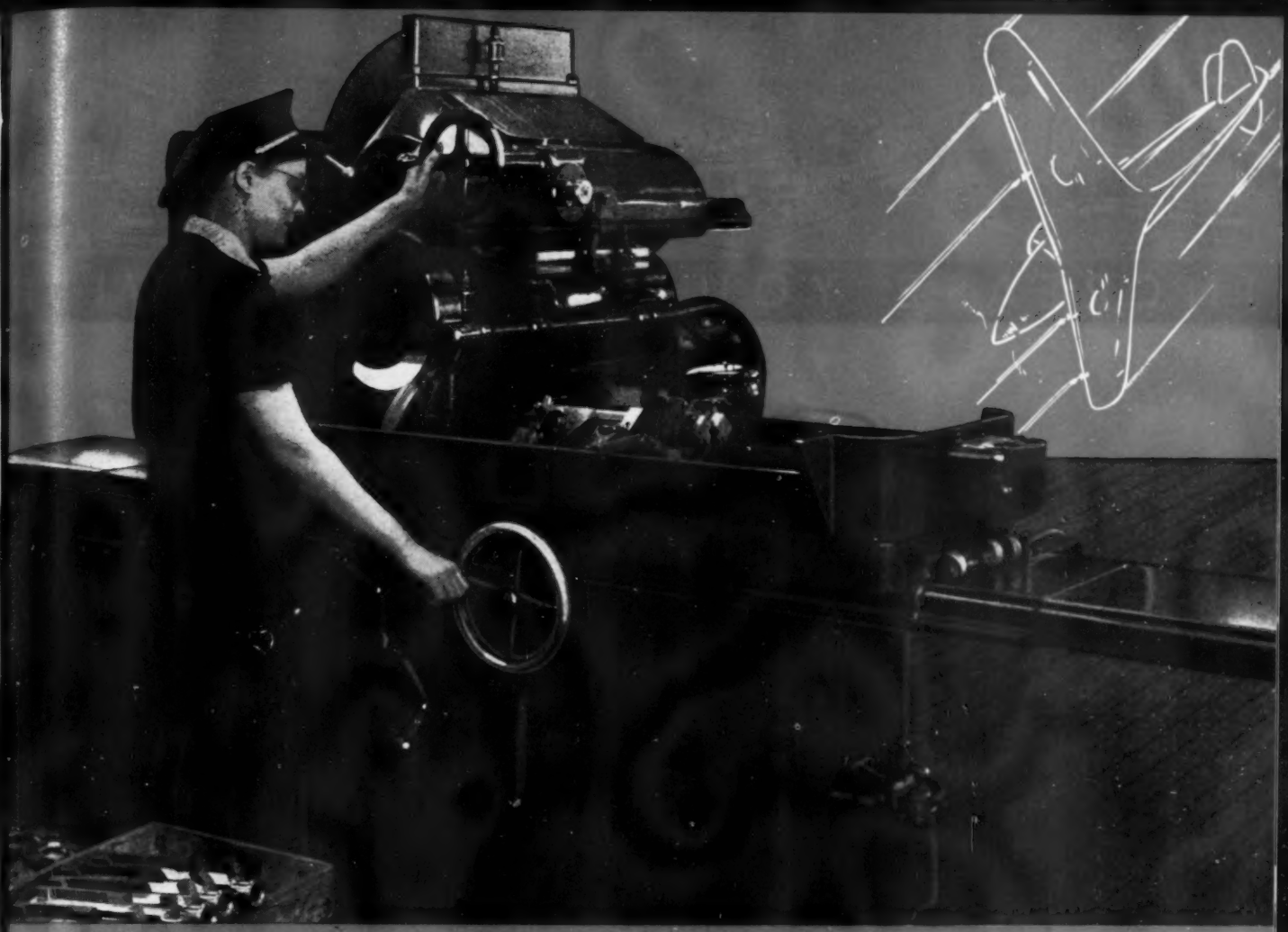
"As one production man to another, all I know is, if you're having night shift trouble, one thing you'd better check up on is your lighting. It may help you. It certainly helped us."

☆ ☆ ☆

If you are running a war factory, won't you have your lighting checked? Call the nearest G-E lamp office. Or see your electric service company or your G-E lamp supplier. Or write General Electric Company, Nela Park, Cleveland, Ohio.

G-E MAZDA LAMPS

GENERAL ELECTRIC



Production

OF SMALL PARTS FOR 20 MM CANNON

Benefits

FROM DELICATE TOUCH OF WOMEN

● Here's a typical example of how the women of America are doing their share to help increase production of vital arms for our fighter squadrons.

Due to the extremely close tolerances required, the delicate touch of a woman's fingers is of real benefit on this grinding operation. Formerly four operations were required to grind each side and the top and bottom of the bolt for 20 m.m. Cannon.

Now this is accomplished in two operations on a Thompson B type Grinder, by means of a fixture holding the piece at a 45 deg. angle, which grinds from the periphery of the wheel. A special form-grinding attachment is built into the machine for dressing the wheel.

The girl operator checks the piece while it is in the fixture by means of indicator gages mounted on it for that purpose. Tolerances of 0.0005 are maintained by these young women.

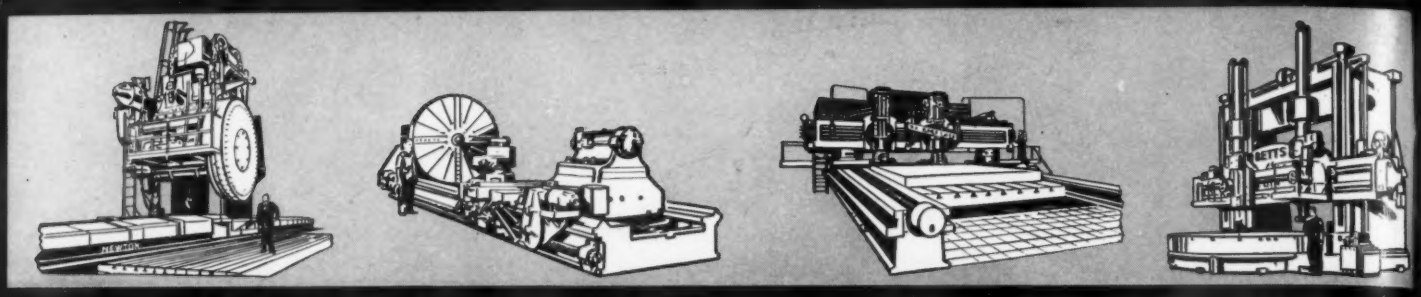
Add to this the simplicity of operation afforded by centralization of controls at the front of the machine—the smooth flow of power to both wheel head and table by the hydraulic drive and you have another reason for maintaining close tolerances 24 hours a day—seven days a week with Thompson Grinders.

If you have a grinding problem — consult Thompson Engineers — they can help you.

Built in sizes 6"x10"x18" to 36"x36"x220"

THE Thompson GRINDER CO.

SPRINGFIELD, OHIO



INCREASE YOUR CAPACITY WITH C

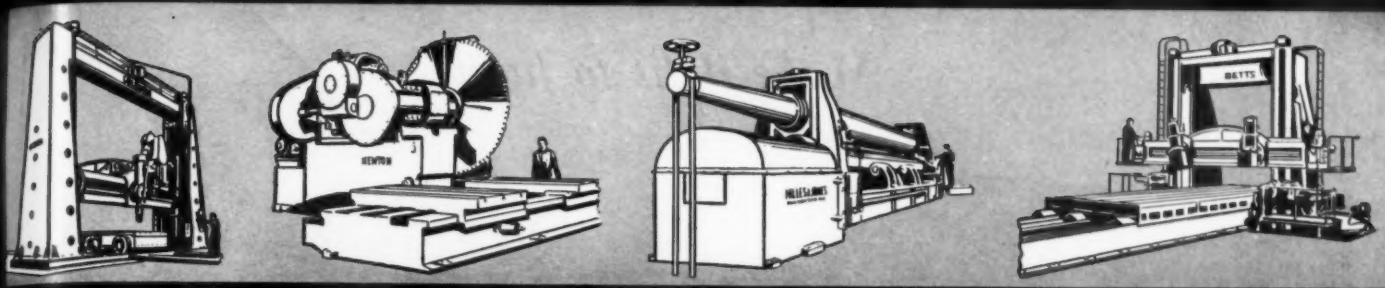
These large Betts Planers have been found one of the essential machine tools in the production of large ordnance, ships and ship propulsion machinery. The machine illustrated is 15 feet between housings. It has three bed ways to distribute the load evenly when the table is carrying very heavy work.

BETTS • • • BETTS-BRIDGEFORD • • • NEWTON

CONSOL

MACHINE TOOL

ROCHESTER

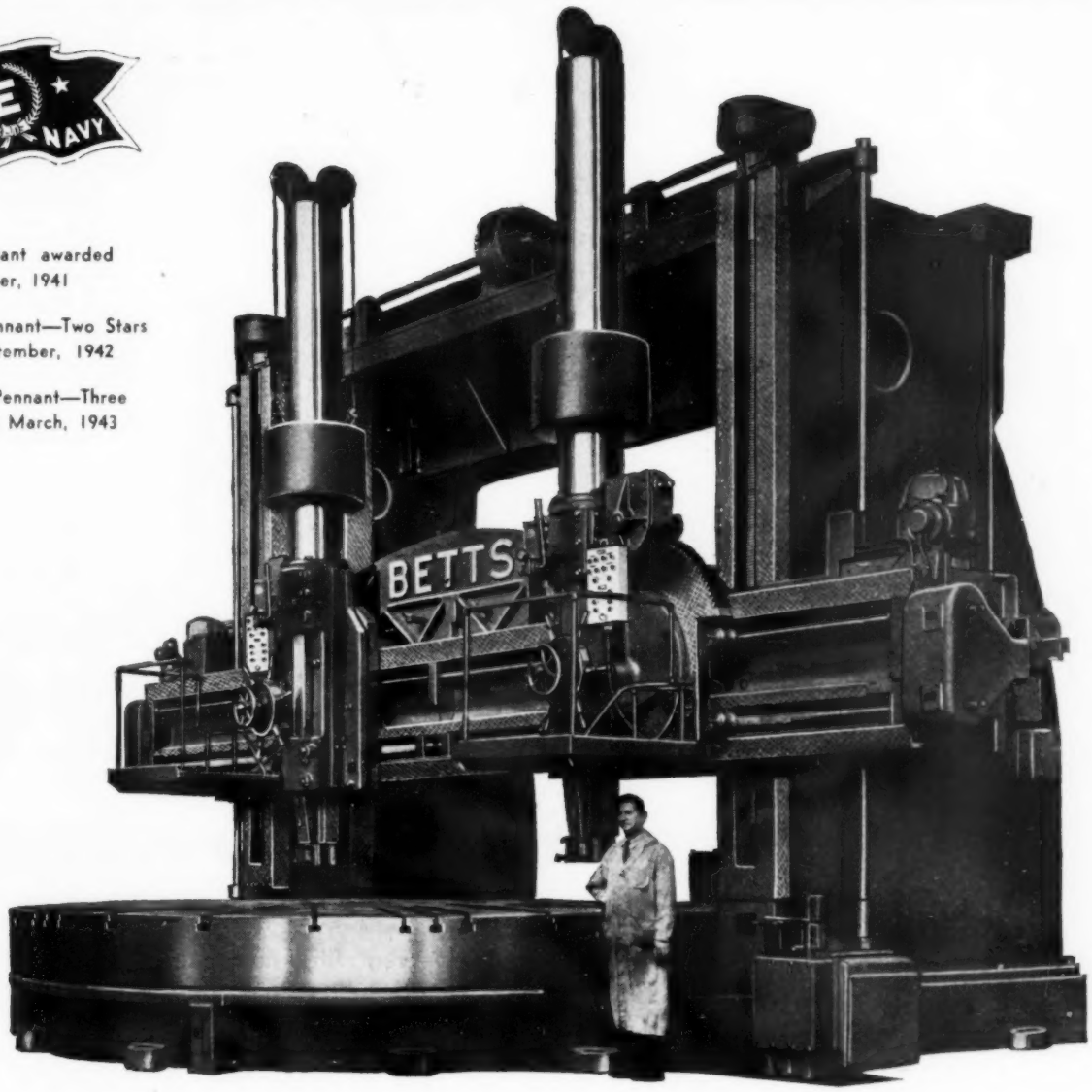


CONSOLIDATED MACHINE TOOLS

Navy E Pennant awarded September, 1941

Army-Navy E Pennant—Two Stars awarded September, 1942

Army-Navy E Pennant—Three Stars awarded March, 1943



Betts Boring Mills have many new and exclusive features that make them outstanding for the tremendous jobs imposed by our Victory program. Operation of the machines has been simplified by motorization of the various functions and improved lubricating systems have lessened the task of maintenance. Boring Mill illustrated swings work 20 feet in diameter.

COLBURN • • • HILLES & JONES • • • MODERN

I D A T E D

CORPORATION

NEW YORK

Make it fit to fight!

ARE NO STRANGERS!

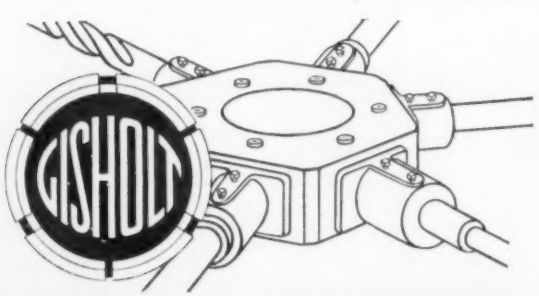
AS THOUGH made by the same hands—carefully matched and fitted—these parts slip together in a final machine assembly. Both are accurate, *right*—and ready to fight for America.

Distance is no barrier to interchangeable manufacture when close limits of accuracy are observed. This fact makes possible the larger manufacturing volume to speed up the war effort.

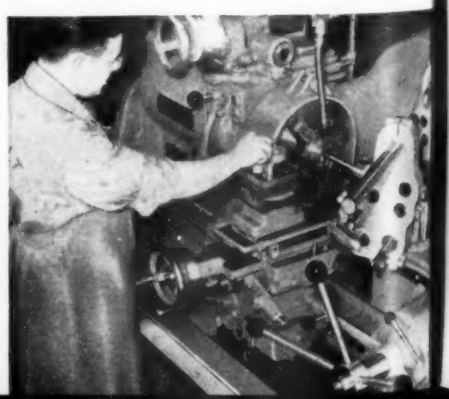
This close-tolerance machining is the work Gisholt Turret Lathes are doing as their part to hasten the day of Victory.

GISHOLT MACHINE COMPANY, 1201 East Washington Ave., Madison, Wisconsin

Look Ahead . . . Keep Ahead . . .
With Gisholt improvements in metal turning



At Gisholt, the Army-Navy "E" and the Treasury Flag fly side by side.



TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

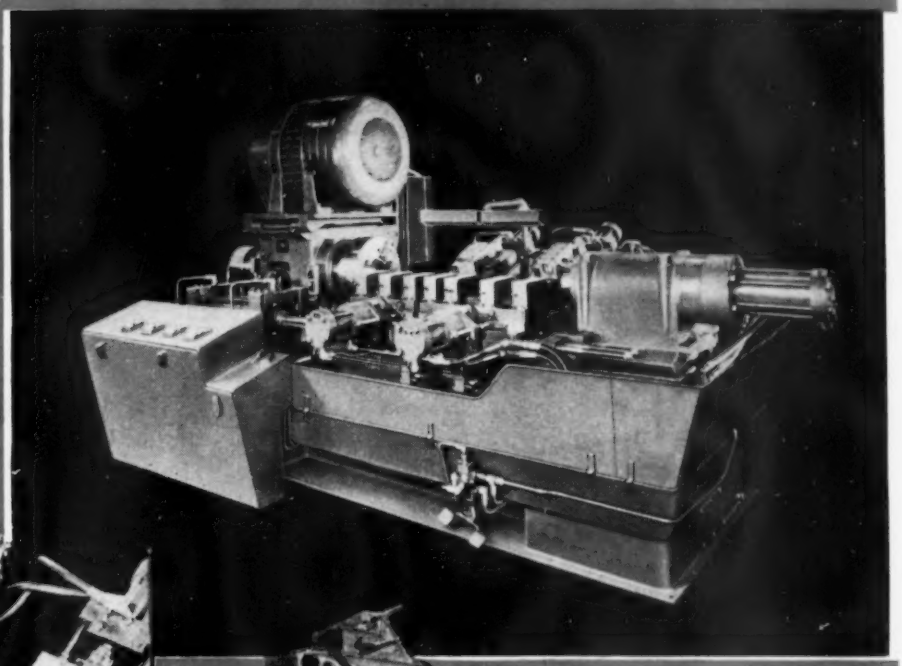
MAXIMUM PRODUCTION WITH MINIMUM EFFORT

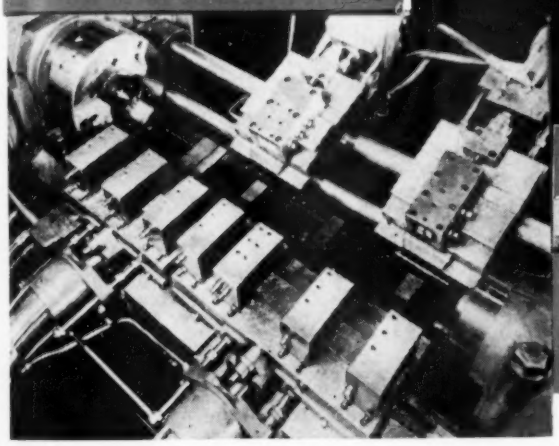
assured by the

SPARKS

SEMI-AUTOMATIC HYDRA-FEED

MANUFACTURING LATHE





tooled for

ROUGH TURNING TANK SHAFTS

Five diameters and three facing jobs handled by 11 tools in a single set-up of work

Outstanding tooling possibilities, backed by sturdy design, hydraulically operated chuck and tailstock as well as power for utilizing fastest cutting tools to maximum capacity are among the features which contribute to the high production rate of the SPARKS Manufacturing Lathe.

The tooling set-up shown here—engineered around a standard machine—was developed by Sparks engineers to handle rough turning of shafts for tanks.

DETAILS OF JOB

Length of shaft turned—44"
Average dia. of shaft—5½"
Number of different diameters turned—5
Tooling and operations: 8 front tools turn 4 diameters; 3 back tools are used as follows: 1 turning a diameter and facing and 2 handling 2 facing jobs on a flange.

DETAILS OF MACHINE

For the job shown, a standard Sparks Semi-Automatic Manufacturing Lathe is equipped with a carriage 42" wide and two individual back slides for back tools. In addition a long 9' bed is used. Design is such as to provide ample chip clearance for heavy roughing cuts.

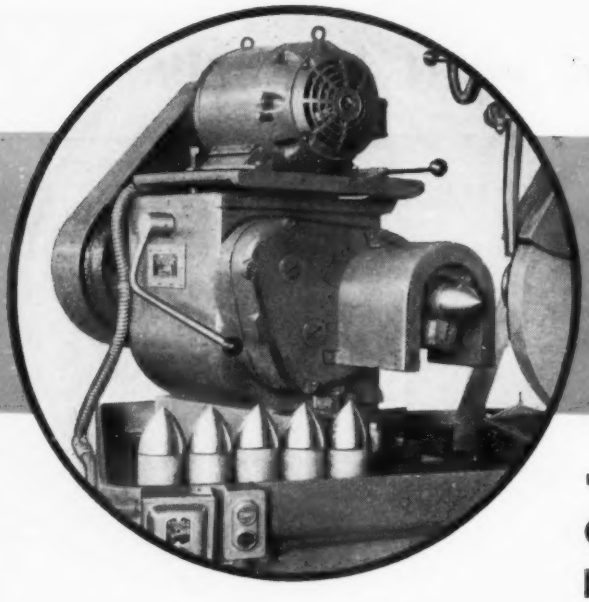
Smooth, accurate performance on a wide range of work is assured by headstock equipped with ball and roller bearings and providing four selective speeds.

The facility with which the Sparks Lathe lends itself to a wide range of tooling together with its ruggedness and long-lived accuracy mean that this machine can be used to speed production and cut costs long after it has served its purpose on war work.

Write for full details

SPARKS HYDRA-FEED LATHE

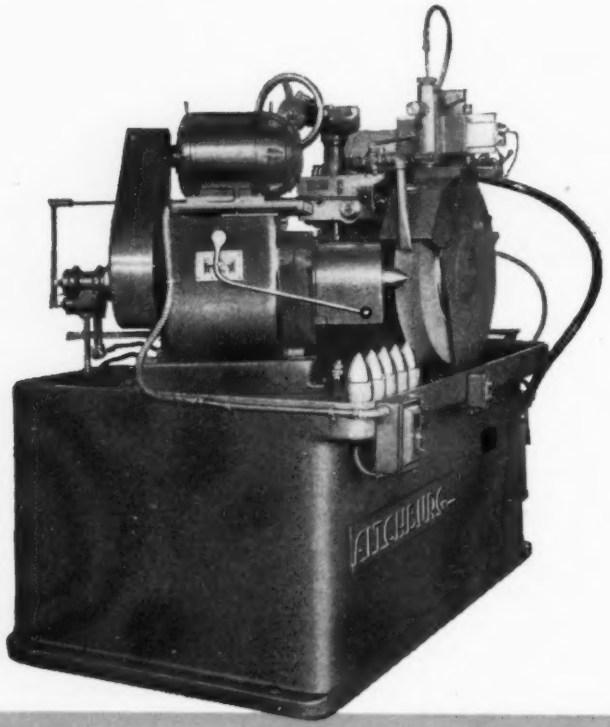
SPARKS MACHINE TOOL CORPORATION
NORWALK . . . . CONN.



on Grinding jobs like this

. . . FITCHBURG OFFERS SPECIAL ADVANTAGES IN MASS PRODUCTION

This Fitchburg special Chucking Grinder with a heavy duty headstock, is designed for grinding the ojive of armour piercing shells. The wheelhead is a Fitchburg Standard Bowgage Unit carrying a 24" x 3½" face wheel. A hydraulic form trueing device is mounted on the wheelhead.



To operate this machine the operator places the shell in the open jaw chuck, then, by pushing a ball lever forward, closes the chuck, clamping the work piece at a definite distance from the bottom of the shell. To start the work rotation, operator depresses the long lever and pushes the button to start the automatic grinding cycle.

When installing special precision grinding equipment, it is well to remember that the Fitchburg Bowgage Grinding Wheelhead is a standard unit. It can be remounted on standard machines, or on new special bases, for operations other than the one originally specified. This feature protects your investment.

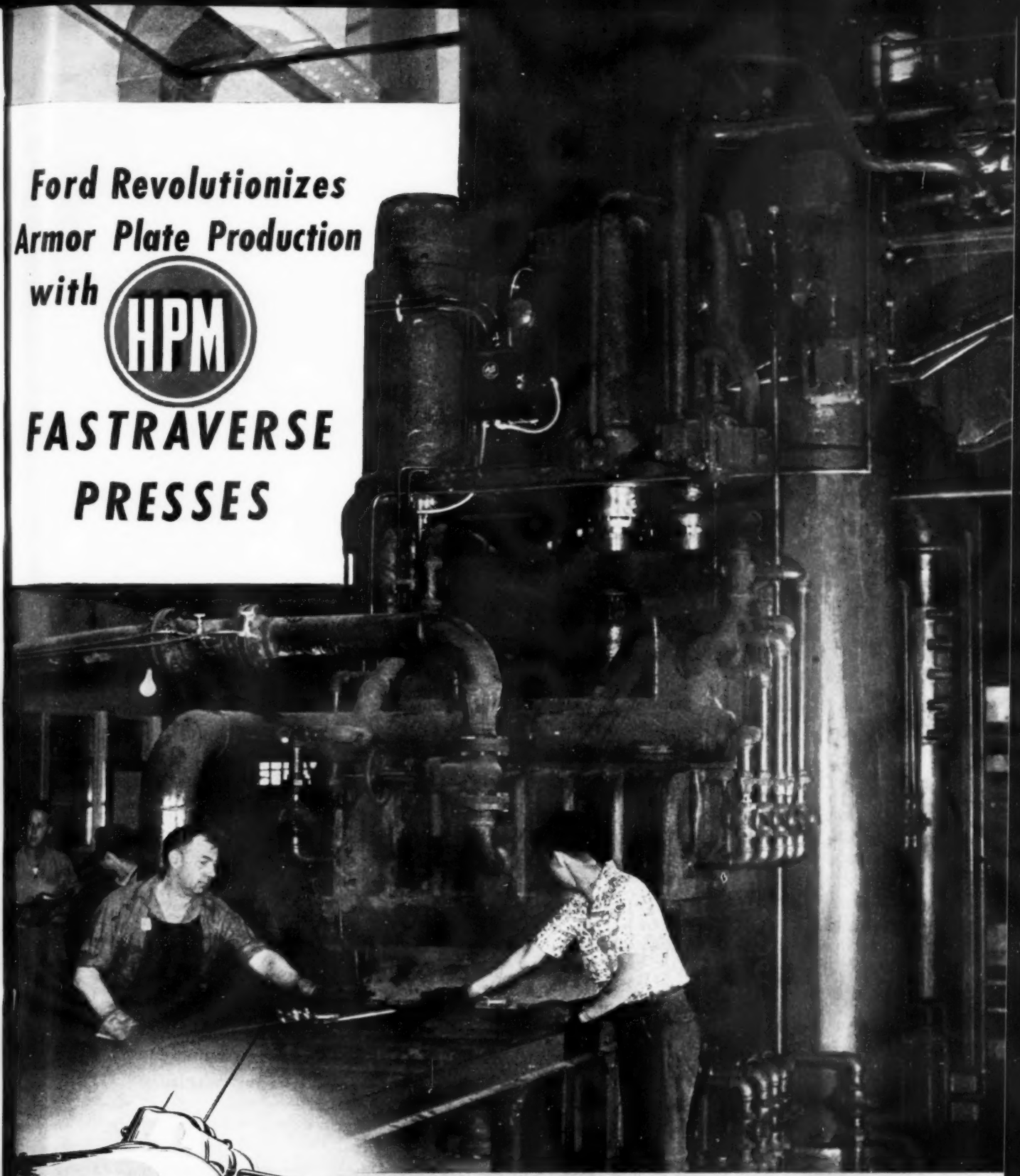
. . . Write today for folder giving complete details.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

Ford Revolutionizes Armor Plate Production with HPM FASTRAVERSE PRESSES



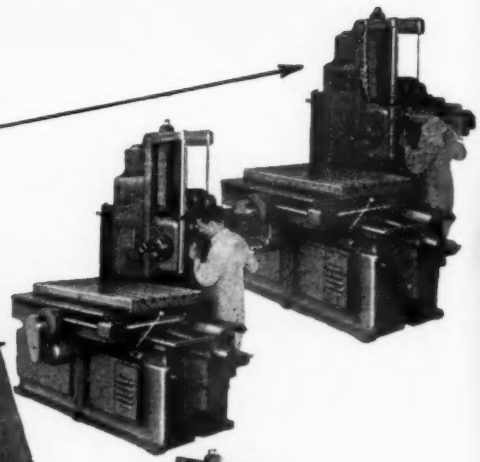
Another industrial advance through the use of HPM Fastraverse Presses is expressed in the revolutionary steel quenching process developed at the Ford River Rouge plant in the production of heavy armor plate for M-4 Army tanks. In but a few minutes of the hours required by the conventional process, this 2500-ton HPM Press with water-cooled dies discharges finished annealed plate flat and straight. HPM Fastraverse Hydraulic Presses are performing equally outstanding tasks on every metal working front.

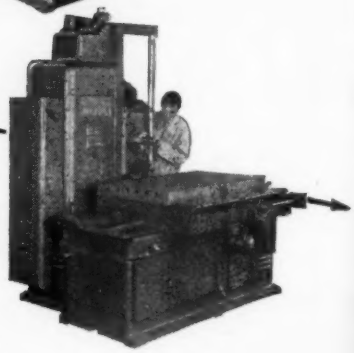
THE HYDRAULIC PRESS MFG. COMPANY ★ Mount Gilead, Ohio, U. S. A.

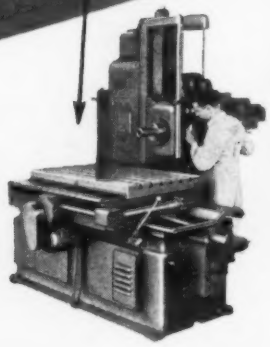
District Sales Offices: New York, Syracuse, Detroit and Chicago • Representatives in Principal Cities

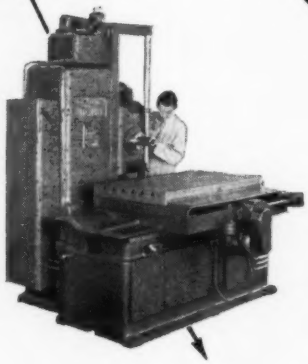
FAR EASIER OPERATOR TRAINING

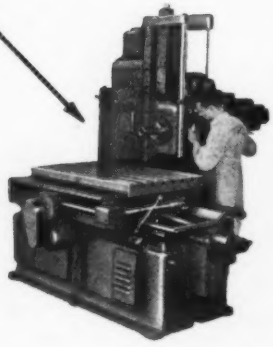
—experience of a hundred users of the DEVLIEG JIGMIL











Experience of more than a hundred users of the DeVlieg Jigmil has proved that operator training is far easier with this machine—because the Jigmil has built in features of quality that do not require a compromise with operator skill to produce accurate work in high production.

Every frequently used function of the machine is controlled in the master switch on the spindle head—at the operator's fingertips. These include:

Spindle start, stop and reverse.

Power vertical feed and rapid traverse movement.

Power horizontal feed and rapid traverse movement.

Power automatic table retraction and repositioning.

Power feed and rapid traverse to bar movement.

The operator never has to take his eyes off the work—never has to look at controls during operation. The machine is so convenient it gives greatly simplified response to the operator's skill.

An operator learns rapidly—frequently reaches full production of high quality in a week or two.

NEW TYPE MACHINE

Spacing accuracy of a jig borer . . . performance qualities of a milling machine . . . convenience and flexibility of a horizontal boring mill.

New speed of operation—many machines show 75% greater average daily productivity.

DE VLIEG MACHINE COMPANY

450 FAIR AVE. FERNDALE (DETROIT) MICHIGAN

Write for Circular

DEVLIEG MACHINE TOOLS

☆ *for your convenience* ☆ *for prompt delivery*

☆ *for faster production*

BOSTON, MASS.	G. R. ARMSTRONG MFRS. SUPPLIES, INC.	KNOXVILLE, TENN.	BROWNING BELTING CO., INC.
NEW YORK, N. Y.	MID-WEST ABRASIVE COMPANY	CHICAGO, ILL.	MID-WEST ABRASIVE COMPANY
BUFFALO, N. Y.	HARTFIELD-HEALY SUPPLY CO., INC.	MILWAUKEE, WIS.	REDI-PRODUCTS COMPANY
PHILADELPHIA, PA.	TRISTATE CORPORATION	ST. LOUIS, MO.	MID-WEST ABRASIVE COMPANY
PITTSBURGH, PA.	G. A. TURNER, INC.	KANSAS CITY, MO.	KEYSTONE TOOL & SUPPLY CO.
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MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. MILWAUKEE AVENUE **DETROIT, MICHIGAN**

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

Mid-West

★ *Honing Stones*

★ *Superfinishing Stones*

★ *Grinding Wheels*

★ *Emery Cloth*

★ *Sandpaper*

Mid-West Abrasive Company,
1960 E. Milwaukee Avenue,
Detroit, Michigan

Gentlemen: Please send me additional information on Mid-West Micro Bond honing and superfinishing stones.

Name _____

Company _____

Address _____

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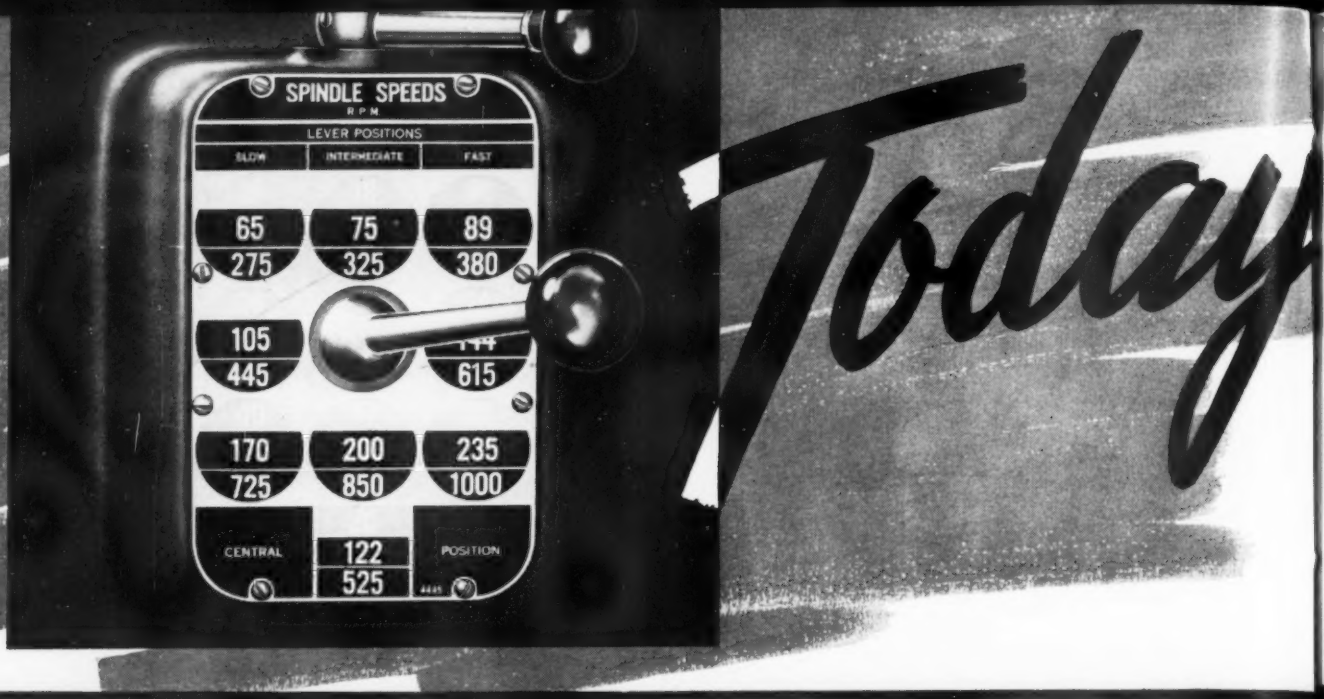
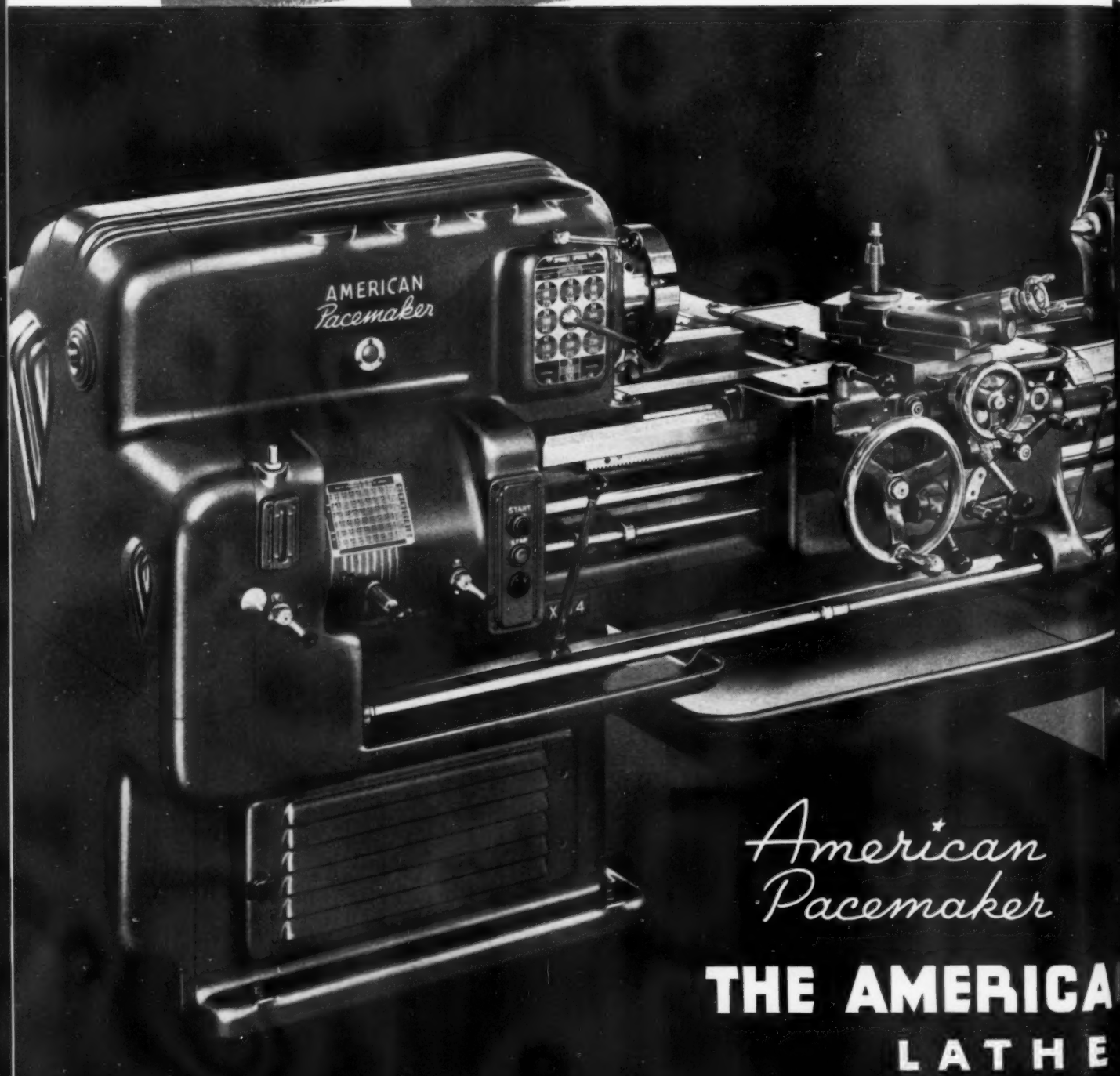


Today



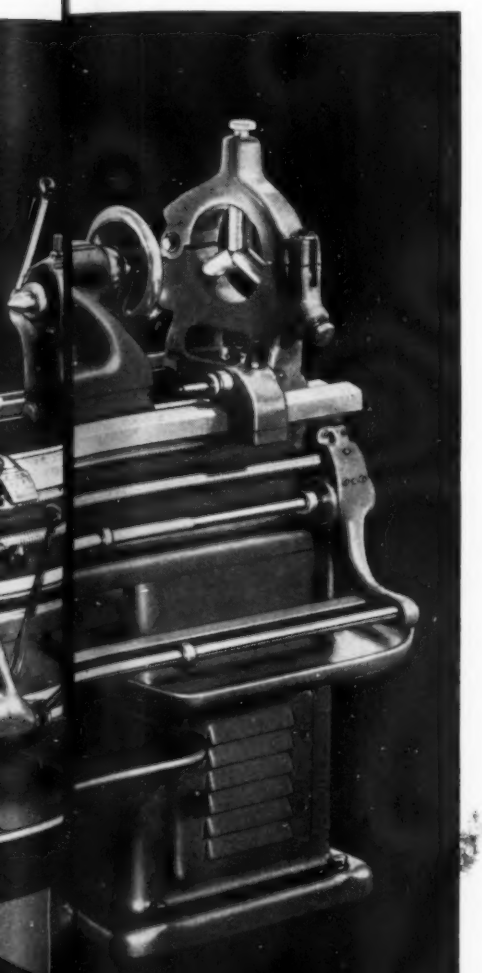
American Pacemaker

THE AMERICA 'O

LATHE

...TIME SAVING

is a MAJOR OBJECTIVE



Speed changes are accurately and instantly made on "American" Pacemaker Lathes.

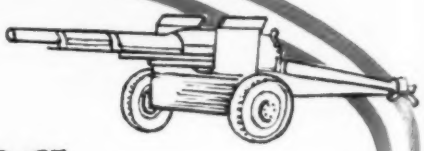
Just two levers provide 27-spindle speeds. Operator does not have to remember speed charts or lever positions—the speed plate is direct reading and right in front of him.

This new operative convenience, plus lots of power and fine lubrication are helping to speed up production—maintain accuracy and increase effective life of "American" Pacemaker Lathes.

Bulletin No. 15 is liberally illustrated to show the Pacemaker's many functional advantages.

CA'OOL WORKS CO., Cincinnati, U.S.A.

E RADIALS • SHAPERS

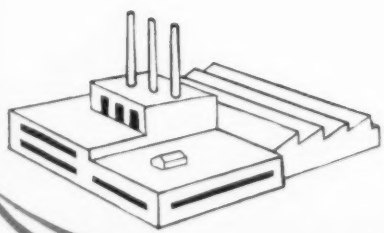


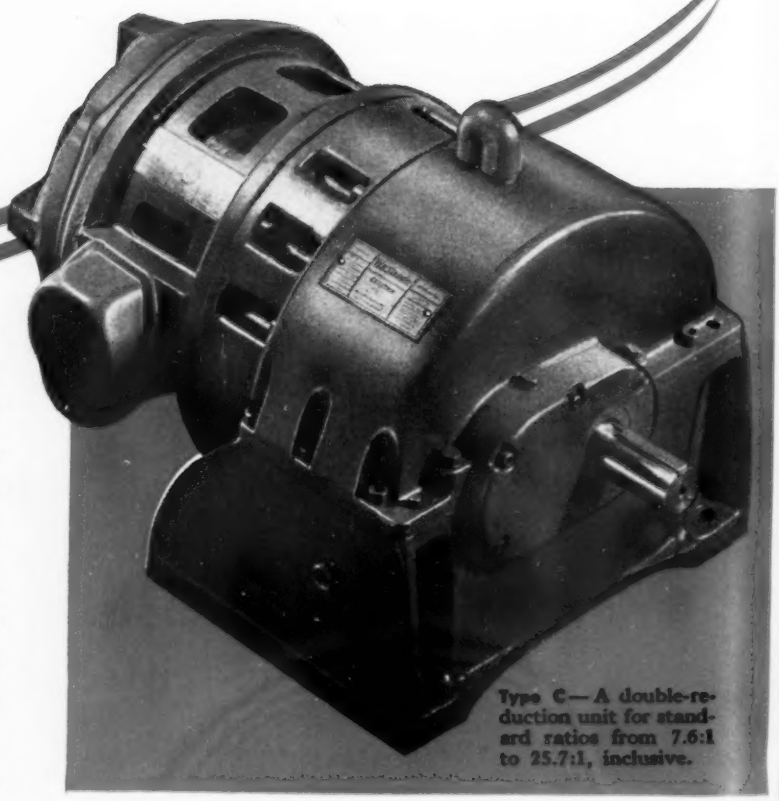
Announcing

A NEW GEARMOTOR

to fight

TODAY'S PRODUCTION BATTLES





Type C—A double-reduction unit for standard ratios from 7.6:1 to 25.7:1, inclusive.

Westinghouse offers you a complete new line of gearmotors designed for present and anticipated postwar needs. Fifty years of Westinghouse gearing experience have gone into this redesign . . . resulting in *improved gearmotors* that can be produced *faster*.

For War Production, these new gearmotors are standardized for easy, correct application; improved for more efficient service; simplified for faster delivery. For postwar conversion, the Westinghouse line offers units that can be moved easily to new locations; interchangeability of parts for long service; streamlining that blends with modern machinery.

Ask your Westinghouse representative about this efficient, new gearmotor. He will be glad to consult on your present speed-reduction problems, or designs for the future.

The New

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

Simplified

FOR . . . EASIER ORDERING · QUICKER DELIVERY · EASIER MAINTENANCE

Meets A. G. M. A. Recommendations—makes it easy to select gearmotors for any job. Eliminates confusion in drawing up specifications.

Unit Responsibility of design, manufacture and service. Westinghouse builds both motor and gears.

Easy Accessibility—both gearing parts and motor are easy to inspect and maintain. No need to disturb foundation of gearmotor or driven machine.

"Tough-Hard" Gears and Pinions—because heat treating by the exclusive Westinghouse BPT process hardens gear teeth for longer life; toughens them for greater strength.

Simplified Design requires a minimum number of moving parts, thus involves fewer parts to wear.

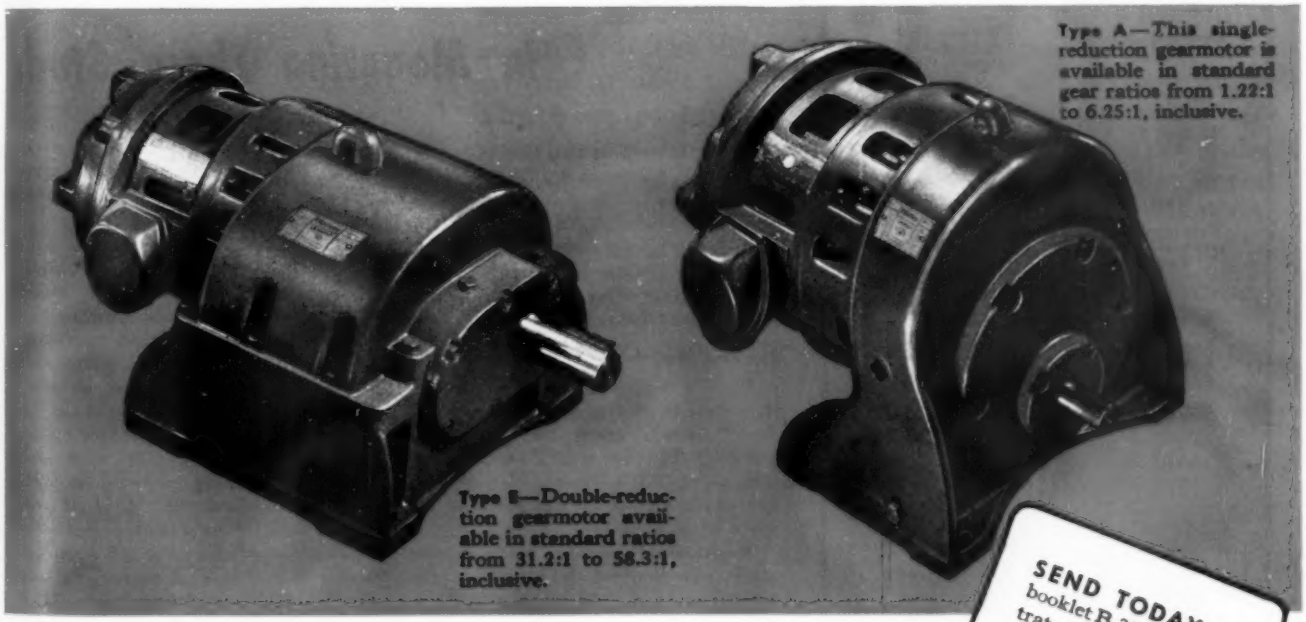
Positive Lubrication of both gears and bearings minimizes maintenance . . . assures long, trouble-free service.

Interchangeable Parts between unit types speed our manufacture of gearmotors . . . reduce your part replacement stock by 40%.

Uses all Westinghouse Motor Types—open, splash-proof, totally-enclosed, or explosion-proof.

Streamlined Compactness saves production space because new gearmotors can be fitted tightly against the machine they are driving.

Improved Foundation Stability assures longer life for both gearmotor and driven machine . . . better holding of alignment, reduced noise and vibration. J-07209



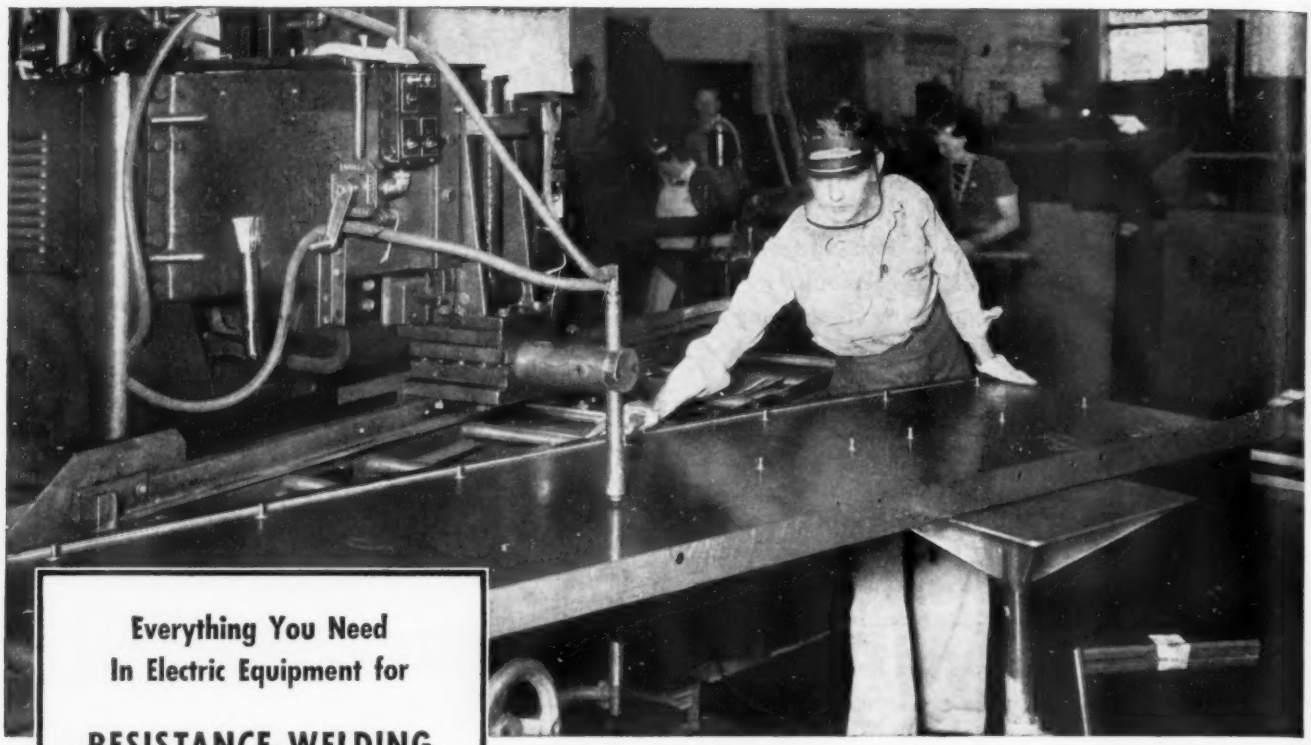
Type A—This single-reduction gearmotor is available in standard gear ratios from 1.22:1 to 6.25:1, inclusive.

Type B—Double-reduction gearmotor available in standard ratios from 31.2:1 to 58.3:1, inclusive.

GEARMOTORS

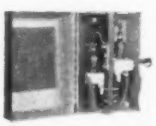
WESTINGHOUSE

SEND TODAY for booklet B-3218. It illustrates practical gearmotor applications—describes the new gearmotor in detail. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pennsylvania, Department 7-N.



Everything You Need In Electric Equipment for

RESISTANCE-WELDING MACHINES

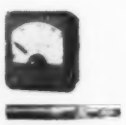


Electronic controls for spot and seam welders

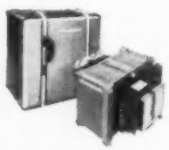
Electronic weld and sequence timers

Weld-recorders—to record electrical input of EVERY weld

Electron tubes for all purposes



Cables and instruments



Air circuit breakers and welding transformers

Capacitors for power-factor improvement

Motors and control

How Spot-welding

SAVED 6 OPERATIONS

in Mounting These Studs

Today—

Insert a stud in the electrode and press the foot-switch. Before your foot returns to the floor, the weld is completed—strong, tough, *fast*. Stud and panel become *one piece* in *one operation*. Yesterday, before spot-welding took over, each stud took *seven operations*.

The Old Way—

Drill a hole, tap it, countersink it, screw in the stud, peen it (so it won't turn), grind off the rough surface, fill the stud head. *Seven* long steps. With 7 tools. But you can *spot-weld* a stud to that panel in the wink of an eye.

Resistance welding with precise electronic control is speeding the construction of light-metal and stainless-steel aircraft. Replaces soldering operations, too, saving tin and time. Joins like or unlike metals or alloys. Gives dependable, consistent results.

It makes gas-tight seams. Saves materials. Simplifies design problems. Relieves the shortage of skilled operators. Resistance welding is ideal for high-production operations on heavy or light work, portable or fixed, with men or women operators.

Whatever your application, be sure to specify G-E *electronic* control and electric accessories with your resistance-welding machine. For further information, contact any G-E office, your resistance-welding machine manufacturer or agent, or write Electronic Control Section, General Electric, Schenectady, N. Y.

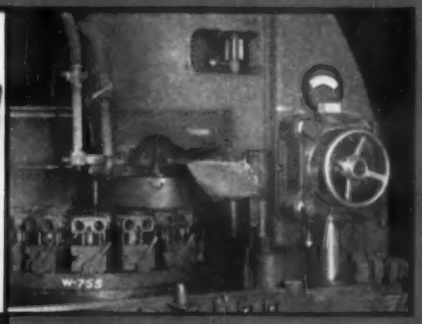
Speed Production Electronically

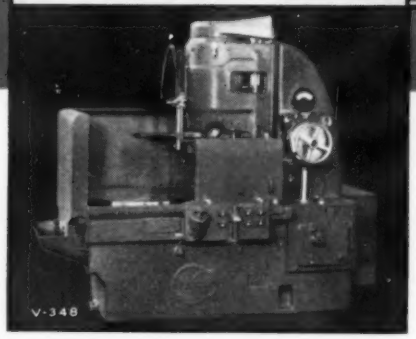
GENERAL ELECTRIC

665-22-8960

"PUT IT ON THE BLANCHARD"

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING





Oil burner pump parts ground on the Blanchard No. 18 Surface Grinder.

- ★ **Production**
- ★ **Adaptability**
- **Fixture Saving**
- **Operation Saving**
- **Material Saving**
- ★ **Fine Finish**
- ★ **Flatness**
- ★ **Close Limits**

THE BLANCHARD NO. 18 SURFACE GRINDER is used to rough and finish grind the oil burner pump parts shown above. They are first ground from the rough, then they are normalized and ground again. All boring and drilling operations are located from the flat Blanchard ground surfaces. After machining, all parts are finish ground on the Blanchard. Twelve pump bodies are ground at once on fixtures mounted on one base plate. The base plate is held magnetically, therefore the chuck may be cleared quickly for a change of jobs. The cast iron pump bodies are 6 inches in diameter. .012″ of stock is ground off one side to limits of +.0003″ —.0001″ at a rate of 48 pieces per hour.

★ . . . . . *Especially valuable on jobs like the one illustrated.*

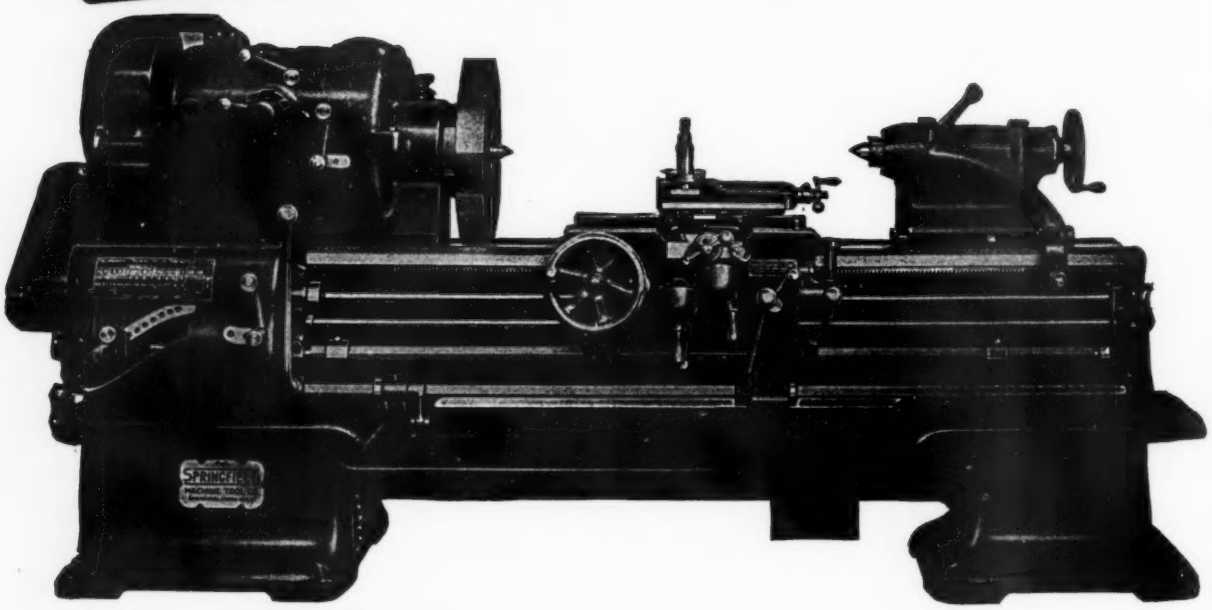
The **BLANCHARD MACHINE COMPANY**

64 STATE STREET, CAMBRIDGE, MASS.

BLANCHARD

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

FOR WAR PRODUCTION



SPRINGFIELD GEARED HEAD LATHES

In the Machine Tool industry's current expansion program to increase production, SPRINGFIELD Geared Head Lathes are playing a prominent role . . . in ever greater numbers, SPRINGFIELDS are being tagged "FOR WAR PRODUCTION". In turn, this demand has caused us to expand our own facilities and services to turn out more lathes, so that more guns, tanks, airplanes and other fighting tools can be economically and efficiently produced. As always, those saving features of SPRINGFIELD Geared Head Lathes—maximum gearing efficiency . . . ingenious attachments . . . rugged construction . . . superior lubricating and power transmission systems, and many more—are showing themselves to be the answer to many problems, particularly where sustained production is the order of the day. For War Production now, and normal operations later, choose SPRINGFIELD—Geared Head Lathes in sizes from 14" to 30". Write for circular #162, concerning prices, delivery dates, etc.

The SPRINGFIELD MACHINE TOOL Co.

SPRINGFIELD OHIO U.S.A.

BARBER-COLMAN
Type "S" Automatic
HOBBING MACHINE

Offers

. . . GREATER ACCURACY AND PRODUCTION IN MAKING

SMALL GEARS

For WATCHES, CAMERAS, CLOCKS, METERS, PRECISION INSTRUMENTS, etc.

WHEREVER small gears or pinions . . . smaller than 1″ diameter or 1″ face . . . are produced, this high-production, accurate hobbing machine is in demand. It is simple to operate after set-up, requiring only loading the magazine and removing the completed pieces. All of the actual cutting operations. . . as well as loading, rapid traverse, feed, return, and eject . . . are fully automatic, governed by positive cycle cams under complete mechanical control and interlock.

On one outstanding war production job a 20-tooth brass escapement wheel, 0.4496″ diameter is being roughed and finished in 92 seconds per load of 38 pieces. Using a topping hob, the O.D. is held within .0009″ or less, and the eccentricity between hole and O.D. within .0004″. Millions of pieces for war are being produced on B-C Type "S" Hobbing Machines . . . in the future, these same machines and others like them will serve to produce many more millions of peace-time parts.

For other Fine Pitch Gear Hobbing Set-ups Refer to Page 50, Hand Book "L".

Buy War Bonds

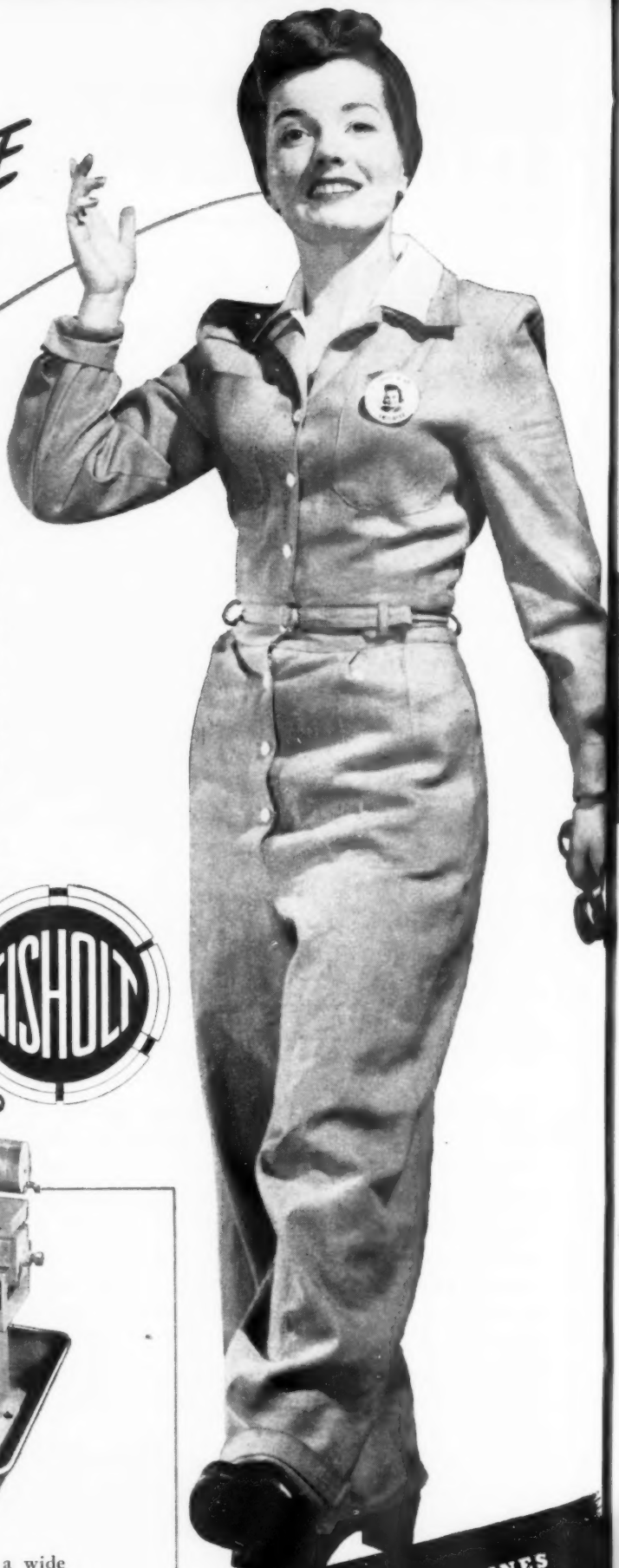
BARBER B-C COLMAN PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

GENERAL OFFICES AND PLANT • 201 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

They said, "NO EXPERIENCE NEEDED!"



It's hard to imagine a machine easier to run than the Gisholt Hydraulic Automatic Lathe. Here, one small lever controls a whole cycle of machining operations. With but little more to do than load the chuck and remove finished work, one operator often tends several machines. Yet, here is sustained high-speed production and accuracy no skilled machinist could equal on a non-automatic lathe.

GISHOLT MACHINE COMPANY

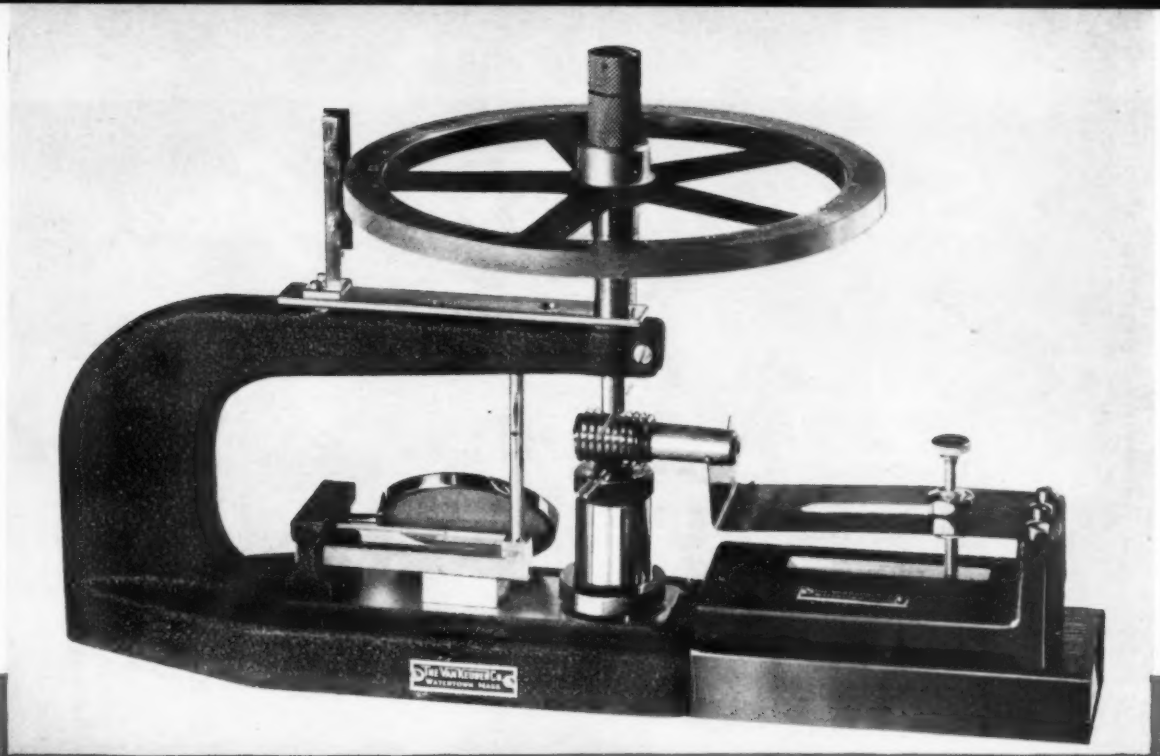
1201 East Washington Avenue • Madison, Wisconsin

Look Ahead . . . Keep Ahead . . .
With Gisholt Improvements in Metal Turning

GISHOLT

THE GISHOLT HYDRAULIC AUTOMATIC LATHE handles a wide variety of chucking and between-centers work. Its extremely rigid construction permits multiple cutting with accuracy at high cutting speeds. Ask for literature.

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES



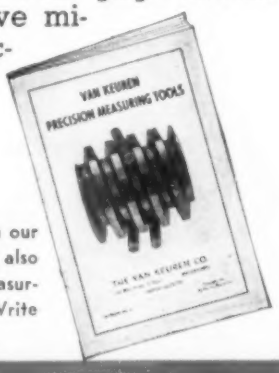
VK LIGHT WAVE MICROMETER FOR SUSTAINED ACCURACY

● **New System of Accuracy**—The VK light wave micrometer is an instrument which has formed the basis for an entirely new method of maintaining high standards of accuracy. No gage blocks are required. Errors from worn gage blocks will not be constantly duplicated in the product.

A calibration chart showing the micrometer screw corrections to .00001" is furnished with each instrument. The new type of hardened and ground precision micrometer screw actually improves with use. Fine workmanship and carboloy wearing surfaces make the instrument accurate and dependable for years of constant service.

● **Controlled Pressure Assures Uniformity**—By using the sensitivity of light waves the VK light wave micrometer insures the exact duplication of measuring pressure by any operator. This controlled pressure feature makes it possible to measure hard or soft materials, and for readings to be duplicated by different operators to .00001".

● **Ideal for Shop Measurements**—The VK light wave micrometer is ideal for making measurements by the 3 wire method, for measuring plug gages, measuring wires, precision parts and shop standards. It is a reference instrument. Forget about comparative measurements with gage blocks—use the VK light wave micrometer. It is fast, accurate and profitable.



THE VAN KEUREN COMPANY
176 WALTHAM ST. WATERTOWN, MASS.

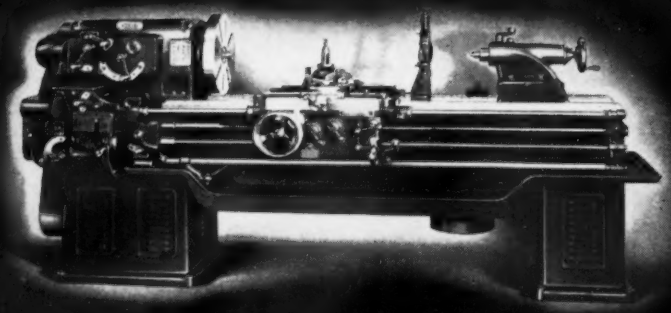
The VK Light Wave Micrometer is described in full in our manual of precision measuring equipment. This book also gives complete tables and simplified formulae for measuring all standard threads, splines and spur gears. Write for your copy!

THE VK SYSTEM... Light Wave Equipment

23RD YEAR

Light Wave Micrometers — Reference Gage Blocks
Microgages — Taper Insert Plug Gages — Wire Type
Plug Gages — Measuring Wires — Thread Measuring
Systems — Gear Measuring System — Shop Triangles

Sidney 16 Speed Group



SIDNEY

Sidney 16 speed lathes are built in a wide range of capacities from 14" to 36".

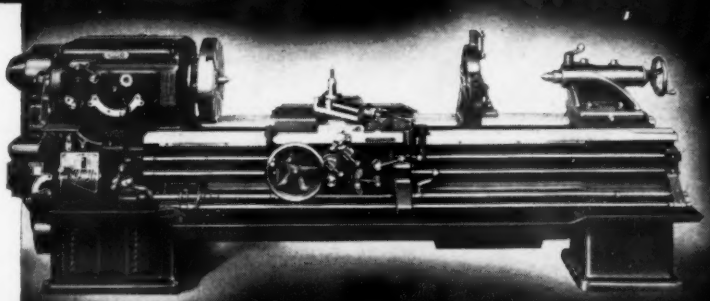
All of these 16 speed models feature continuous tooth Herringbone gearing not only well known but recognized for the greater strength and smoother action resulting from greater tooth contact.

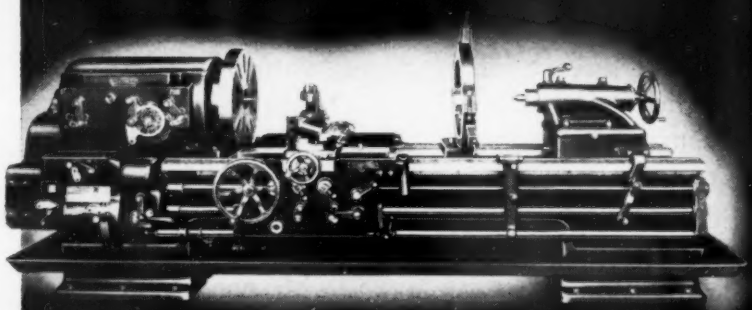
Sidney continuous tooth Herringbone gears are generated and lapped in our own plant to assure the utmost accuracy and smoothest possible finish.

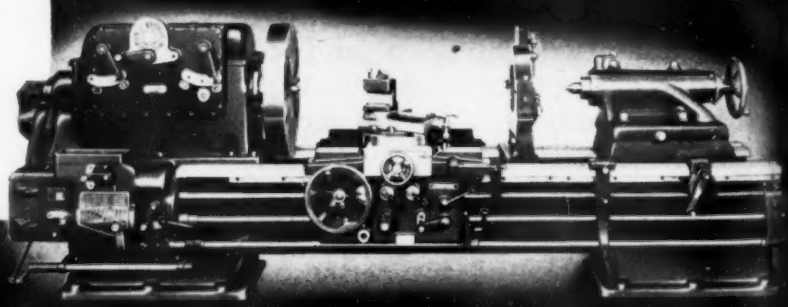
This gearing not only affords greater, smoother power on all sizes but results in highly finished, accurate work free of all tooth marks.

The Headstock is particularly quiet in operation with both spindle and intermediate shaft supported by a center bearing. Internal and external gear tooth clutches operating on multiple spline shafts reduce backlash to a minimum and permit of easy engagement.

For power, speed and continued accuracy Sidney Lathes offer the utmost in dependable lathe performance. Bulletins available.







The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO

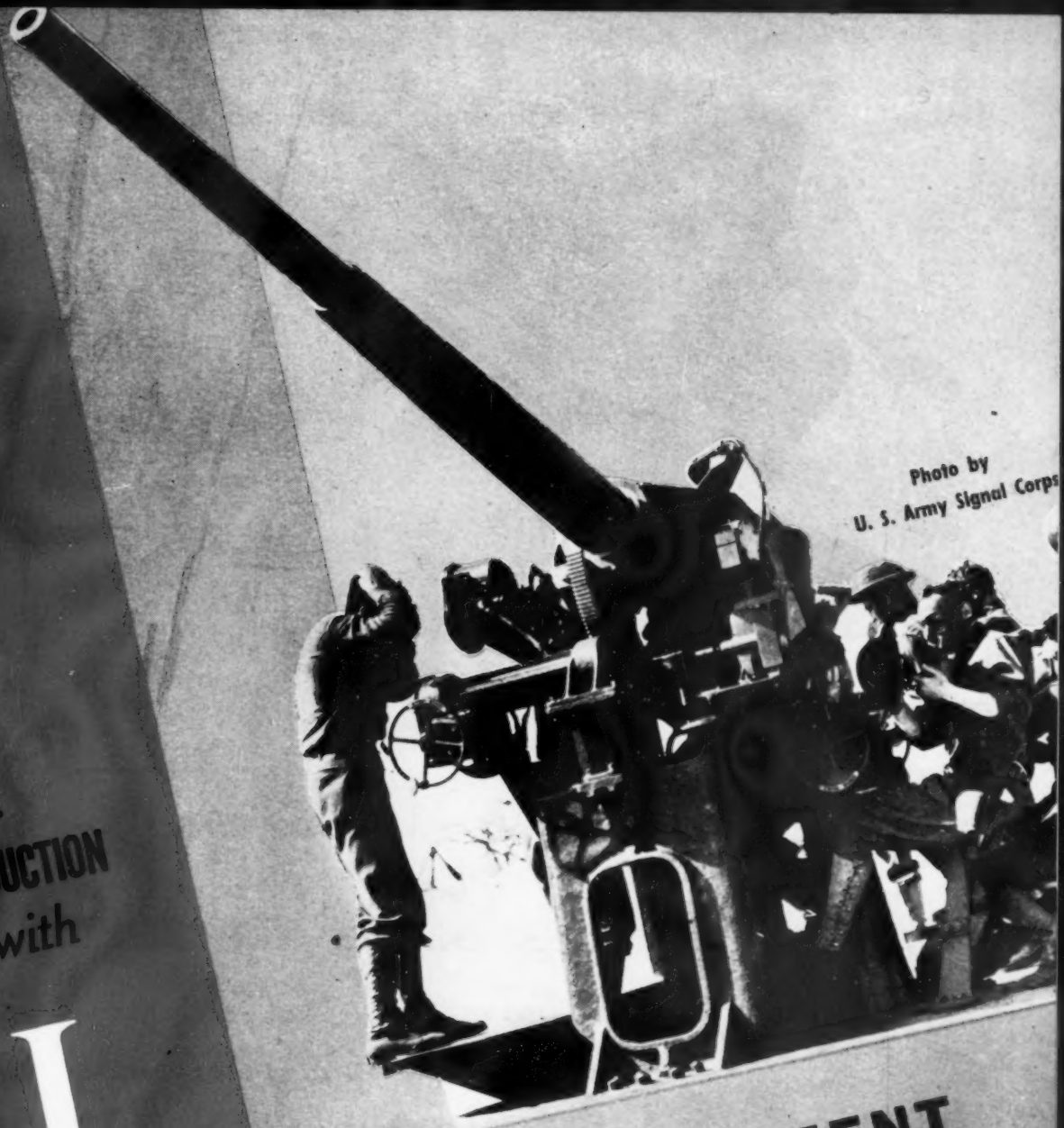


Photo by
U. S. Army Signal Corps

. . . RIGID
ECIFICATIONS
OR ACCURACY
AND SPEED
IN DUPLICATE
PARTS PRODUCTION
are met with

P&J Automatic CHUCKING EQUIPMENT

The urgent needs of war production in the Arsenals of Democracy are not only being met but records are being made one day only to be shattered the next.

Examples of remarkable performance are particularly interesting and frequent where operations are performed on P&J equipment. Developed primarily for duplicate parts production, these machines offer a range of tooling possibilities which are a constant challenge to the imagination of production engineers working toward highest productivity in shortest possible time. By taking advantage of this versatility in tooling, production problems are being readily solved.

P&J service to war production plants is based on long experience in finding better and faster ways of handling jobs in parts production. P&J equipment and P&J tooling provide many opportunities to apply this service advantageously.

The POTTER & JOHNSTON MACHINE CO., Pawtucket, RHODE ISLAND

KEEP GUNS BLAZING AT THE FIRING LINE

Buy More WAR BONDS

estimate revised...

Man-hours required to produce a big Army Bomber

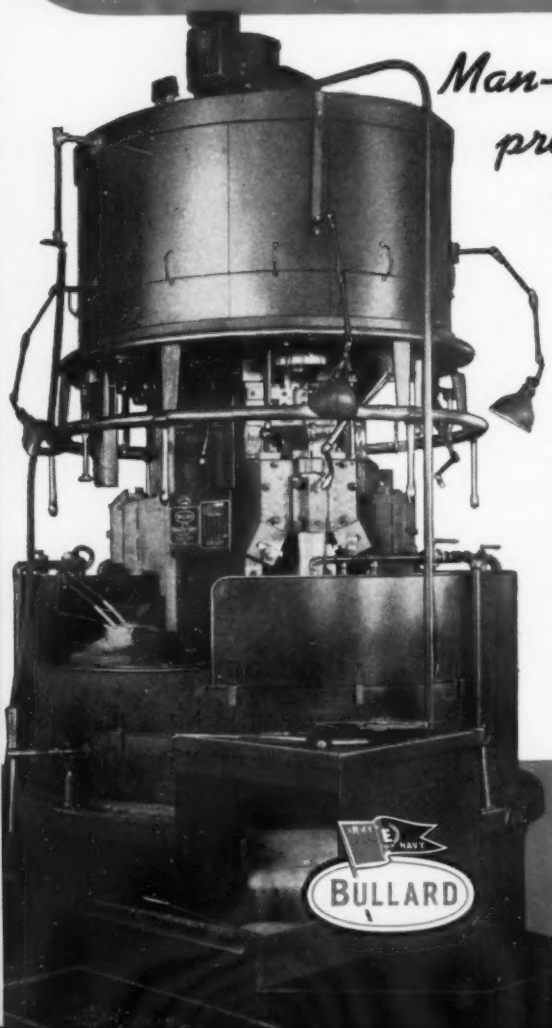
Estimate (1940) ~~110,000~~

Actual (1943) 23,000

Yes, it's a fact. America is building her bombers in a trifle over one-fifth the time originally anticipated. This is based on a statement made by Robert P. Patterson, Under Secretary of War.

Miracles like this don't just "happen". They come from far-sighted planning. And in the making of airplanes, they come from the most generous sharing of experience and improved methods any industry has ever known.

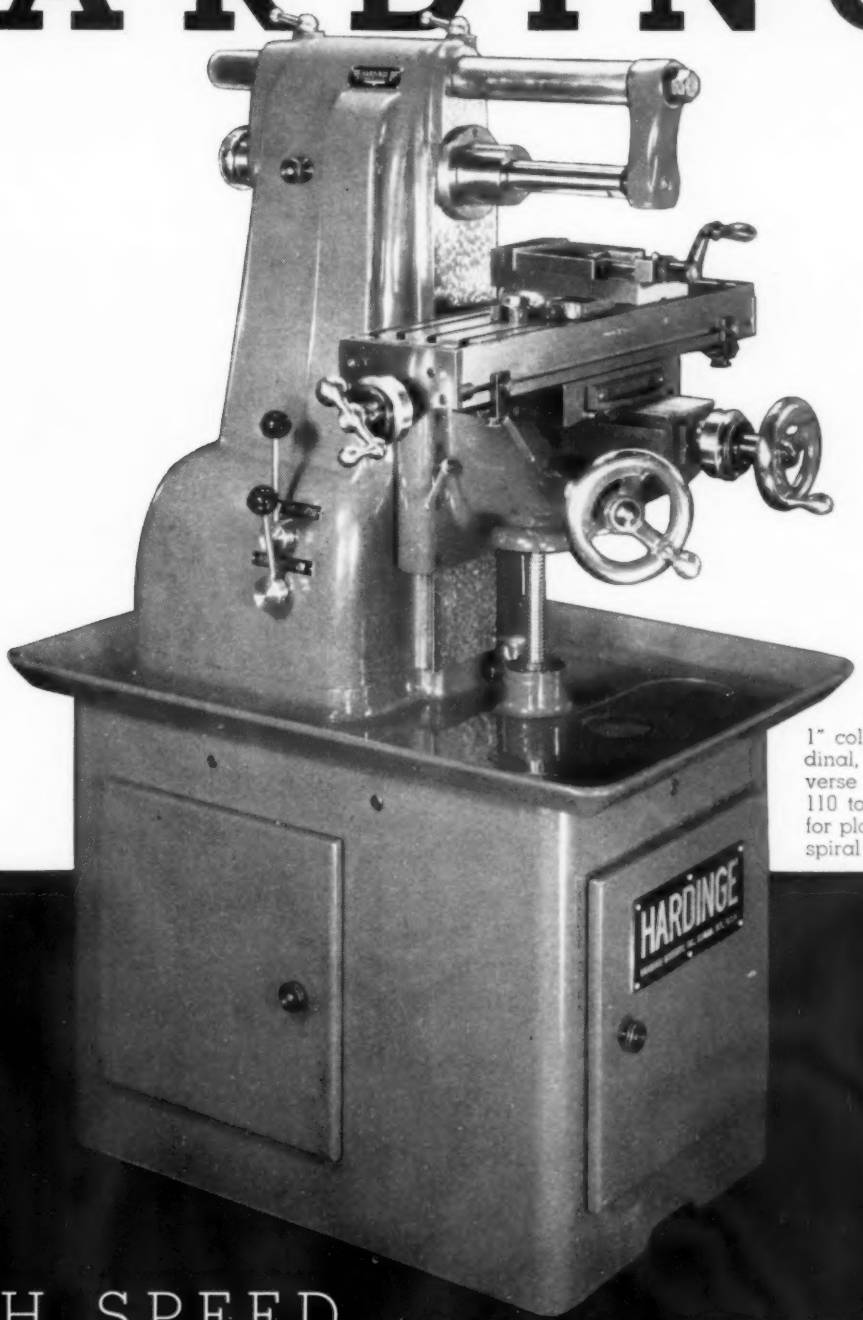
Bullard is proud that so many V.T.L.s and Mult-Au-Matics are helping in this vital work. More Bullard machines are making airplanes today than are engaged in any other industry. And Bullard wishes to contribute all the "know-how" in their experience to assure that every one of those machines does its utmost to push production schedules still further. Call on the Bullard technical staff wherever there's a chance that we can help.



The Bullard Company

BRIDGEPORT, CONNECTICUT

HARDINGE



SPECIFICATIONS

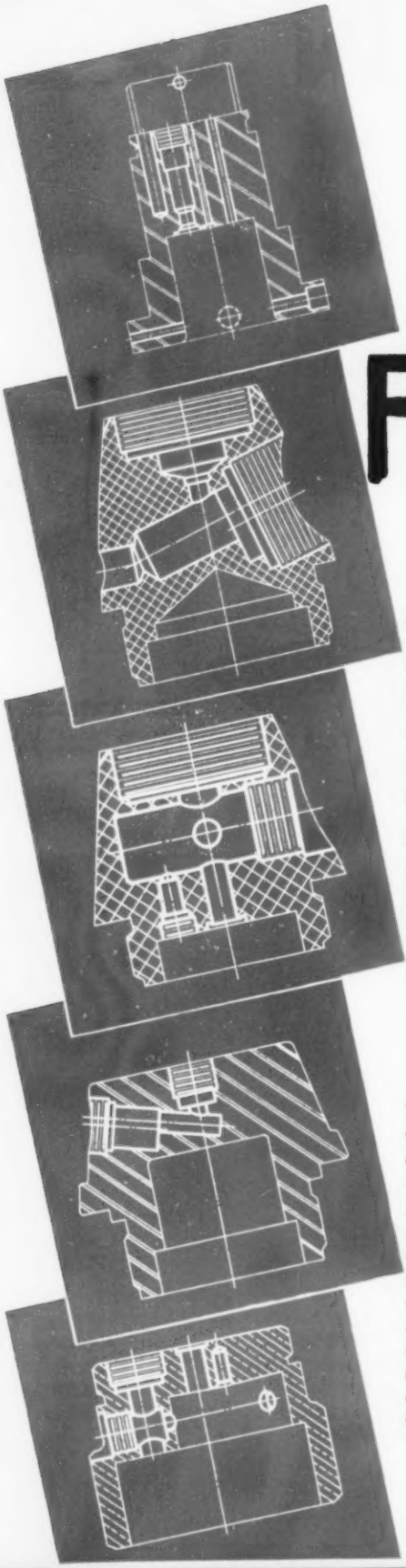
1" collet capacity, 14" longitudinal, 13¼" vertical, 5½" transverse travel, eight speeds from 110 to 1850 R.P.M. TM model for plain milling, UM model for spiral milling.

HIGH SPEED PRECISION MILLING MACHINE

Precision tool room milling is profitable on this milling machine, designed to meet a definite need in the tool room and laboratory. The precision construction, along modern lines, combines ruggedness with extreme accuracy for ease of operation. Investment and time cost will indicate that larger milling machines are extremely expensive and awkward for many tool room and laboratory milling operations.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR

HARDINGE
ELMIRA, N.Y.



Intricate Fuse Parts Produced with Minimum Number of Chuckings

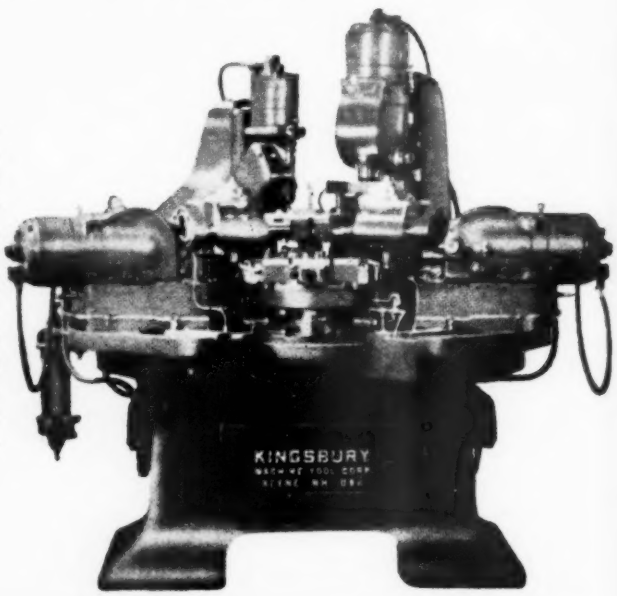
FLEXIMATIC

by KINGSBURY

The blanks for these shell fuse parts are taken from automatics and completed in from one to four handlings. Kingsbury FLEXIMATICS make it possible to perform in a single chucking a dozen or more highly intricate machining operations on fuse and rifle components and similar parts where speed and accuracy are essential to successful National Defense production.

Munitions production presents a three-fold problem . . . high standards of accuracy, pressing production demands and scarcity of skilled labor. Kingsbury FLEXIMATICS provide—in a single machine—the efficient means to solve all three phases of your defense production problems.

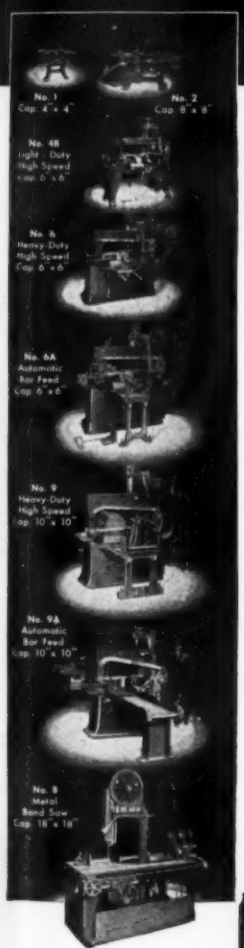
The FLEXIMATIC system of construction consist of Standard Units for drilling, tapping, boring, reaming, spot-facing, etc. Mounted on one of several standard bases. This unique method provides a flexible set-up which can be changed over to meet the machining requirements of many different parts.



KINGSBURY MACHINE TOOL CORPORATION

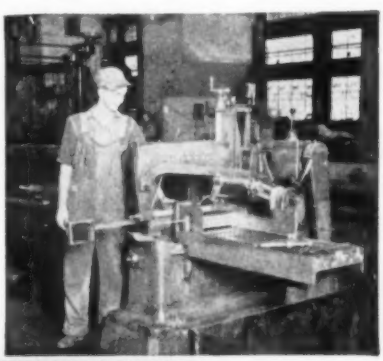
KEENE NEW HAMPSHIRE U S A

MARVEL SAWS



One of these saws "paid for itself in 3 months on two storehouse orders" in a prominent Railroad Shop

Innumerable locomotive shops have modernized their cutting-off methods by installing MARVEL Hack Sawing Machines. While the selection of the saws for each shop depends largely on the capacity range of the work to be encountered in the individual shop, the saws illustrated are typical selections: A No. 18 MARVEL Giant Hydraulic (capacity 18" x 18") shown above for cutting large size bars, billets or forgings, such as locomotive axle stock; and a No. 9A MARVEL Ball Bearing High Speed Hack Sawing Machine (capacity 10" x 10") equipped with an automatic bar feed, illustrated at right, cutting-off 8" stay bolts from 1" bars, 27 at a time.



ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Ave. CHICAGO, U. S. A.

Eastern Sales Office: 225 Lafayette St., New York

ARMSTRONG-BLUM MFG. CO. *"The Hack Saw People"*
5700 Bloomingdale Ave., Chicago, U. S. A. Eastern Sales: 225 Lafayette St., N. Y.

Bolts are important . . . .

—AND YOU CAN'T OPERATE A

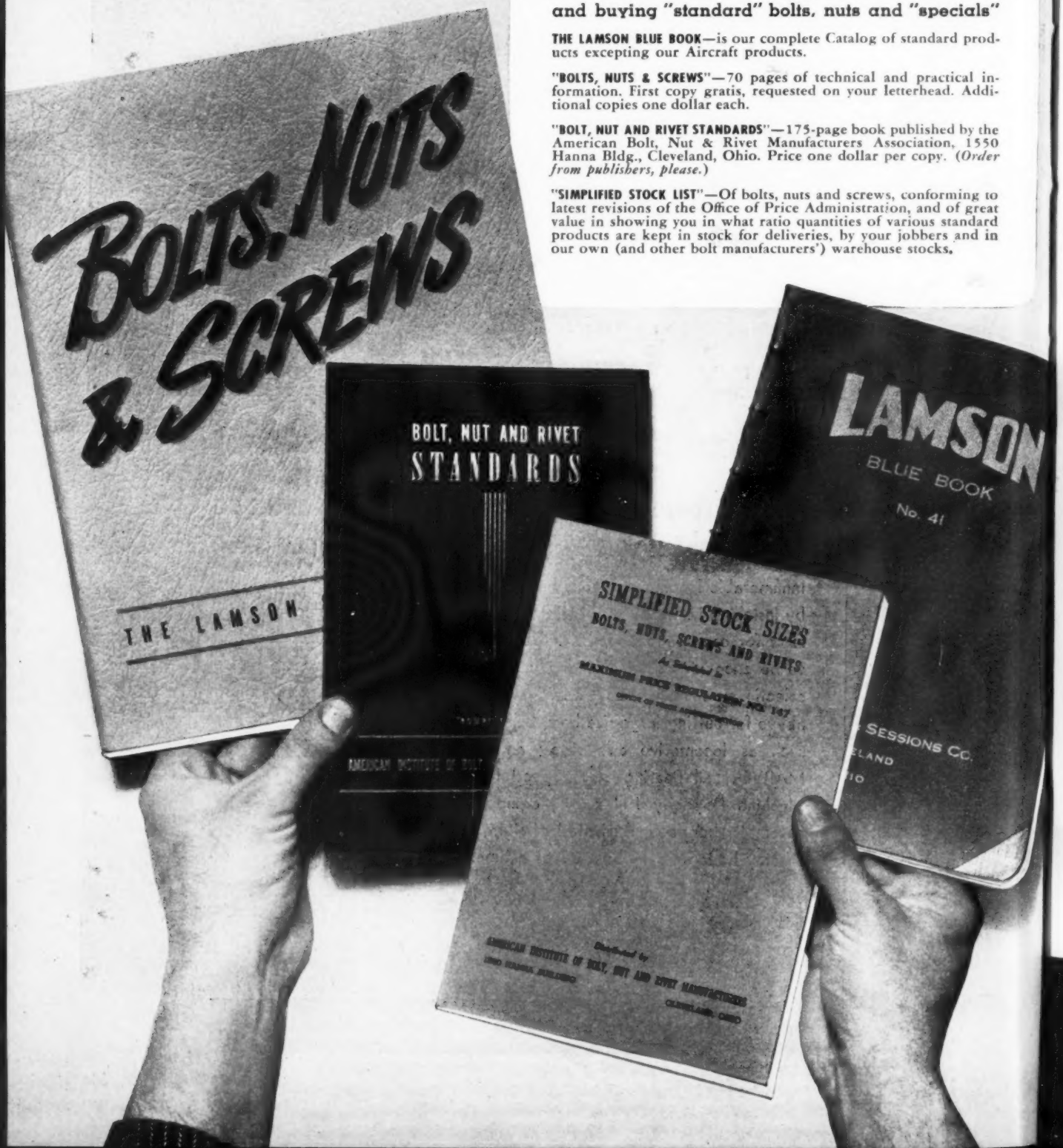
These four books will help you in specifying and buying "standard" bolts, nuts and "specials"

THE LAMSON BLUE BOOK—is our complete Catalog of standard products excepting our Aircraft products.

"BOLTS, NUTS & SCREWS"—70 pages of technical and practical information. First copy gratis, requested on your letterhead. Additional copies one dollar each.

"BOLT, NUT AND RIVET STANDARDS"—175-page book published by the American Bolt, Nut & Rivet Manufacturers Association, 1550 Hanna Bldg., Cleveland, Ohio. Price one dollar per copy. (*Order from publishers, please.*)

"SIMPLIFIED STOCK LIST"—Of bolts, nuts and screws, conforming to latest revisions of the Office of Price Administration, and of great value in showing you in what ratio quantities of various standard products are kept in stock for deliveries, by your jobbers and in our own (and other bolt manufacturers') warehouse stocks.



you can't fight without them

A TANK, SHIP OR PLANE WITHOUT THEM

For this reason it is imperative that you know as much as you possibly can about bolts.

You should know how they are made and why some bolts are made much differently than others.

You should know what materials are available today for the bolt manufacturer, which are the critical materials and which one of the NE steels may be substituted to obtain as good a bolt.

You should know the difference between actual bolt strength tables and theoretical bolt strength tables as shown in steel hand-books, for bolt manufacturers' actual experience and engineering research has developed more reliable tables for strength of threaded products.

You should know—and this is extremely important to designers—that you can obtain a standard size and type of bolt from stock that, properly heat treated, will produce higher physicals than a bolt of approximately *twice its weight or size,* thereby saving steel in their making, and requiring a smaller hole in the materials to be bolted.

You should know that a bolt made "special" to your designs requires "special" handling from start to finish in every department of our plants, and reaches you much later *than had you designed to use a standard bolt.*

You should know that all too frequently a "special" bolt required by your designers in good faith may be found by our engineers, working in collaboration with your own, *to be entirely unnecessary.*

All these are somewhat commonplace conditions to our engineers whose sole business is making bolt and nut products.

The first thing to do is to ask our engineers for help—after you have familiarized yourself with the most common bolt manufacturing methods. And this we have made easy for you to do in this way—we have made available our standard Catalog, the Lamson Blue Book, which lists all sizes of standard products excepting aircraft products; and we have made available a book, already well known, with the title, "Bolts, Nuts & Screws," containing valuable reprinted technical articles, well illustrated, some of them written by our own engineers and some by engineers from other manufacturers, all of them authentic. (This book later on will be revised with additional articles, published since its first edition, but the new articles will be available as separate reprints before the book is revised.)

And then there is now available a booklet of vast importance to use in connection with any manufacturer's catalog, the new "Simplified Stock Sizes of Bolts, Nuts, Screws and Rivets," as scheduled in maximum price regulation No. 147 by the Office of Price Administration. This stock list will even be of help to your designers, for it shows relative quantities of standard sizes of bolts kept available *and if they design for standard bolts,* this tells you whether they can obtain them readily from stock.

Finally, there is the "Bolt, Nut and Rivet Standards" book, published by the American Institute of Bolt, Nut & Rivet Manufacturers, invaluable itself, which sells for one dollar.

Here is condensed knowledge, bolt manufacturing and application experience, available to you for the asking. If you are making war materials, directly or indirectly, you know the problems that come up every day due to employment of inexperienced help, skilled or unskilled. A good engineer may lack a knowledge of bolts—have his own work hampered—because of it. Here then is an opportunity to get a lot of practical experience and up-to-date guidance, "in a package." You can depend upon the contributions of our own engineering and production men, when you call them in, because Lamson & Sessions' five plants are operated by men whose organization has over 75 years experience in the bolt business.

Buy U. S. War Bonds and Stamps
—an investment in America

THE LAMSON & SESSIONS COMPANY, 1971 W. 85th St., Cleveland, O.

HERE'S A COUPON FOR YOUR CONVENIENCE

The Lamson & Sessions Company
1971 West 85th Street
Cleveland, Ohio

(Please be sure you read directions on opposite page for getting a copy of "Bolt, Nut & Rivet Standards.")

Please send us ☐ Lamson Blue Book; ☐ Bolts, Nuts & Screws; ☐ Simplified Stock Sizes, to the undersigned.

Name of Individual _____ Title or Kind of Work _____

Employed by (Name of Company) _____

Street Address _____

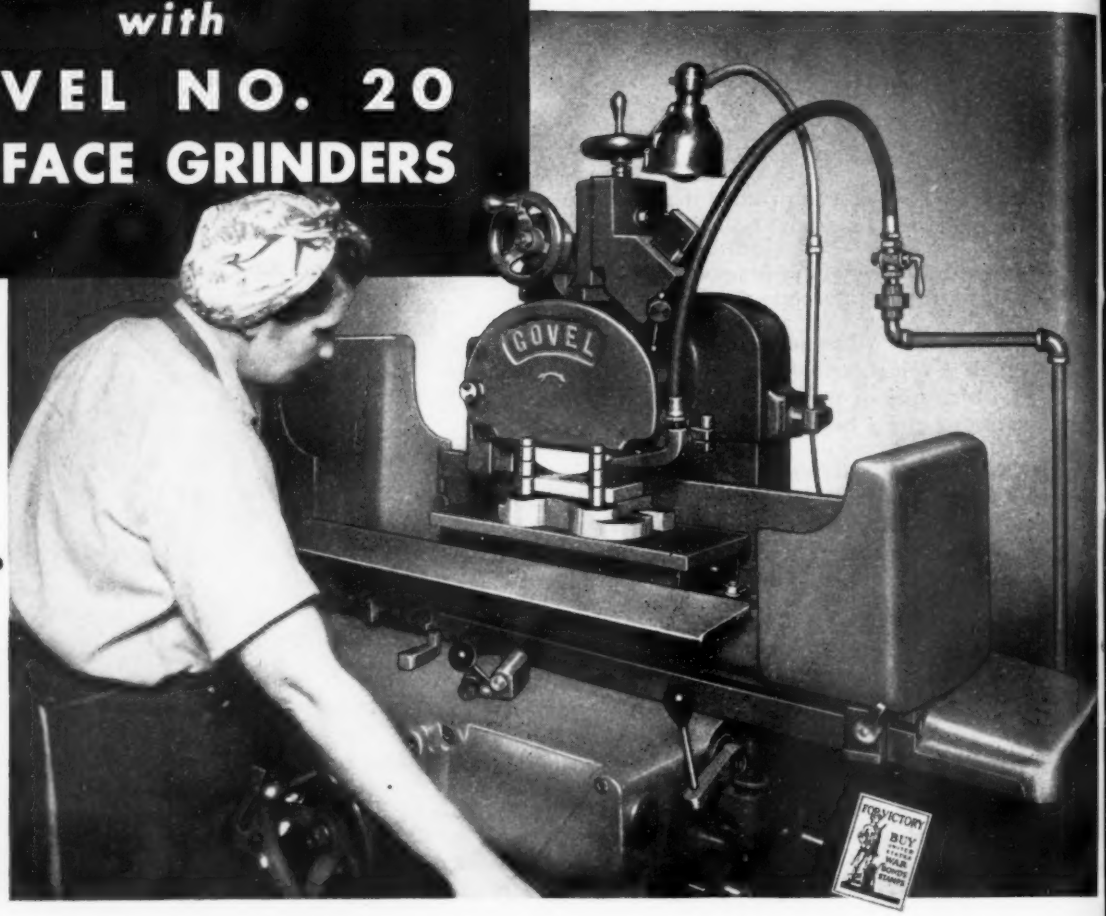
City and State _____

LAMSON & SESSIONS

BOLTS · · NUTS · · COTTERS · · CAP SCREWS · · SPECIALS

Your Jobber Stocks the Lamson Line

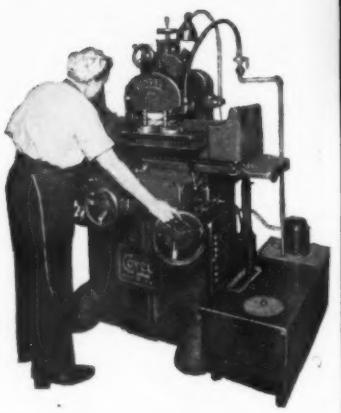
SPEED DIE MAKING
with
COVEL NO. 20 SURFACE GRINDERS



Shorten Employee Training Time With COVEL Equipment

Minutes saved in grinding add up to priceless *hours* saved in the vital job of die-making. In the operation shown here a Covel No. 20 is finishing a die surface to a close tolerance at high speed. Note that it was not necessary to remove the die's leader pins. Thus the time usually required to accurately replace and re-align the pins could be devoted to actual production . . . No. 20's flexibility, ease of operation and maintenance, and long life account for its popularity where speed *plus precision* is essential.

Covel's No. 20 (6" x 18") Hydraulic Feed Surface Grinder is described in Bulletin A83. Write, wire or phone for your copy today.

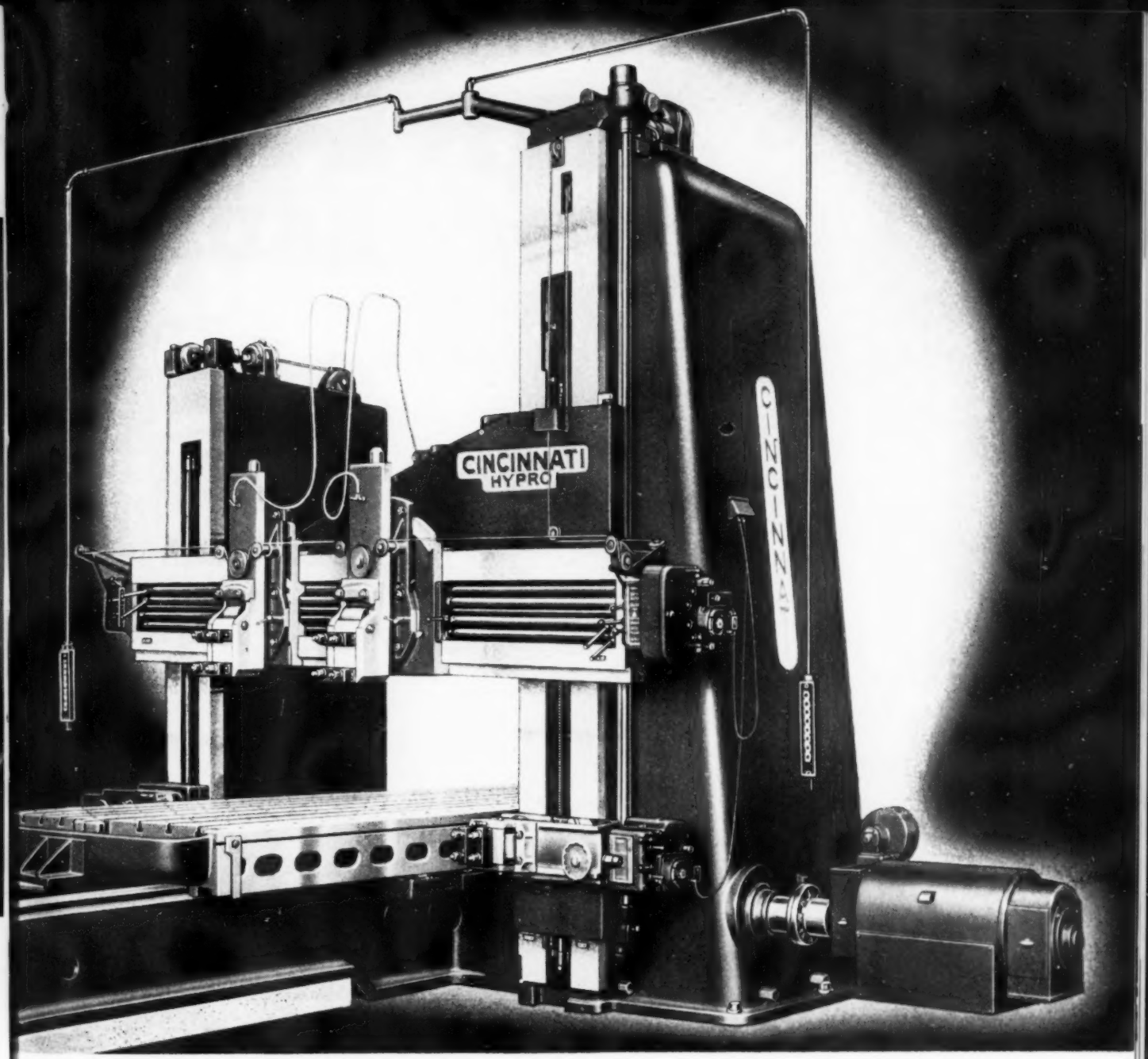


PROMPT DELIVERY TO WAR INDUSTRIES

Grinding Machinery Since 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICH.



CINCINNATI HYPRO PLANERS

Help Supply More Ships for Allied Support • • • QUICKLY

• A Cincinnati Hypro Convertible Open Side Planer, size 132"x96"x40', is being used by a U. S. shipyard to machine large metal parts swiftly and economically. This planer is equipped with scarfing gears on the rail head to scarf armor plate. Note the auxiliary left-hand convertible column with side head attached. Machines like this are well adapted to machining ship parts due to their rigidity, flexibility and accuracy.

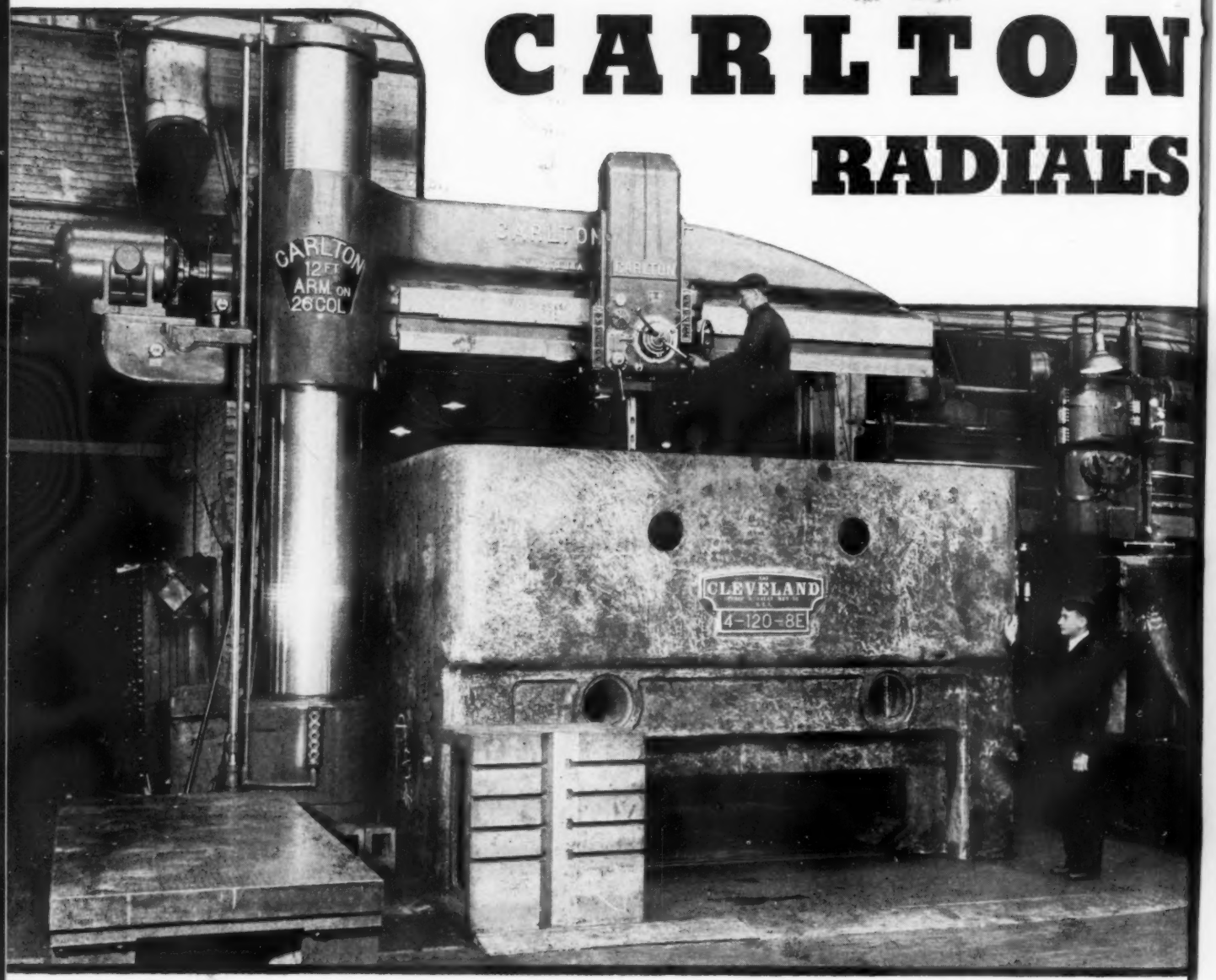
SPEED—POWER—
CONVENIENT CONTROLS

All contribute to the ease of operation and high production records of Cincinnati Hypro Planers. For complete information about Hypro Openside Planers write for Bulletin 110.

THE CINCINNATI PLANER COMPANY
Planers...Vertical Boring Mills...Planer Type Millers
CINCINNATI OHIO U S A

FOR THOSE DIFFICULT JOBS

CARLTON RADIALS



CARLTON
RADIAL DRILLS
are furnished with 3' to 12' arms and 9" 11" 13" 15" 17" 19" 22" and 26" column diameters.

• One of the outstanding characteristics of a Carlton Radial is its versatility. This is graphically illustrated on the job shown. Here a Carlton 12 foot—26" column radial is drilling various diameter holes in a steel casting which is 184" long—87" wide—and 100" high. When completed this huge casting will be used as a crown for a modern Cleveland Four Point Press.

In addition to capacity to handle both large and small jobs the Carlton features rigidity and accuracy as a result of its low hung drive. On all Carlton Radials the main driving gears are below the arm driving off the largest diameter of the spindle nearest the cutting tool.

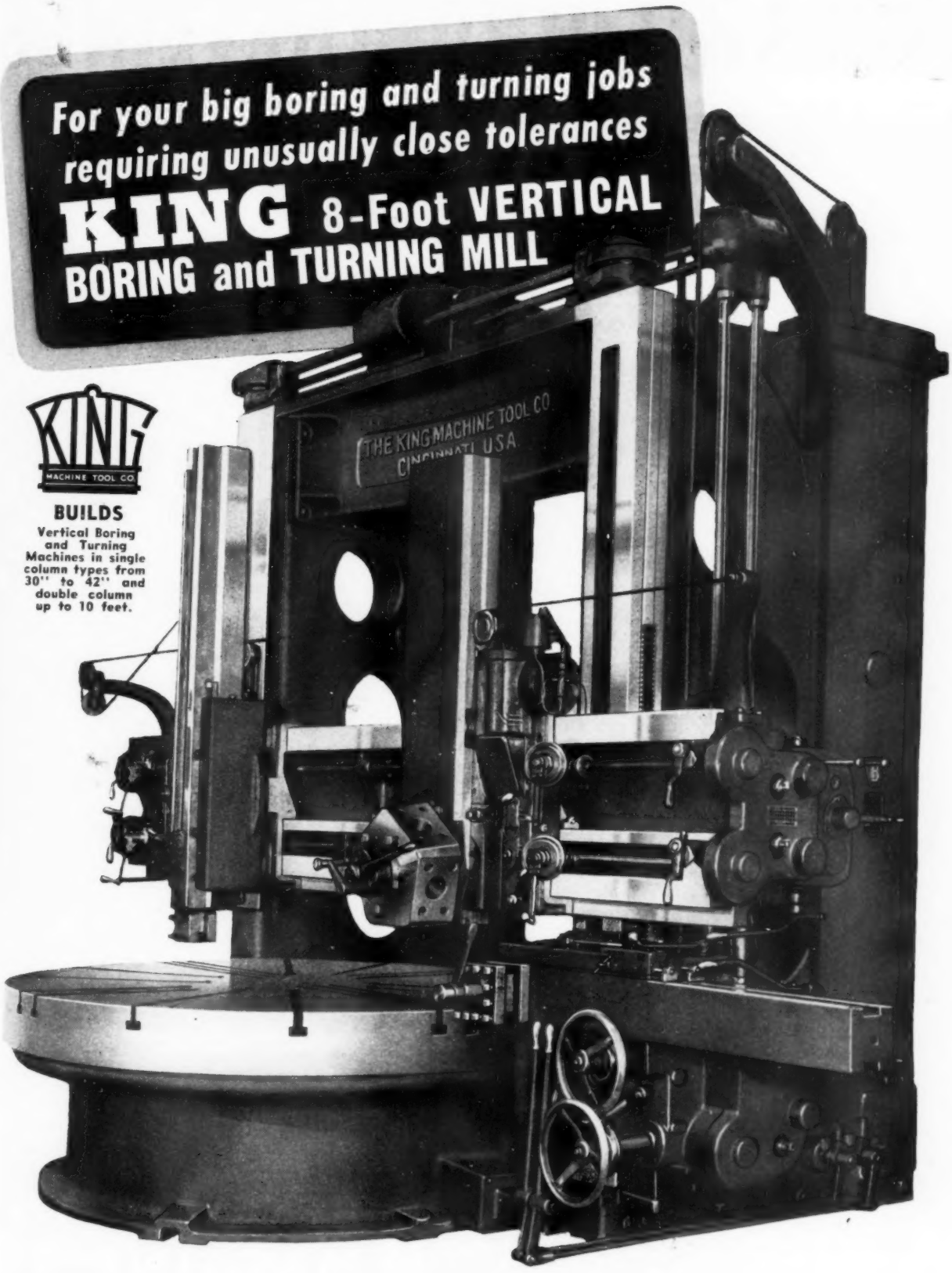
If you have a tough assignment requiring a radial drill—put the job on a Carlton. It has the capacity to handle difficult jobs accurately—quickly—economically.

Full descriptive bulletin upon request

THE CARLTON MACHINE TOOL COMPANY
CINCINNATI - - - OHIO

For your big boring and turning jobs requiring unusually close tolerances

KING 8-Foot VERTICAL BORING and TURNING MILL



KING MACHINE TOOL CO.

BUILDS

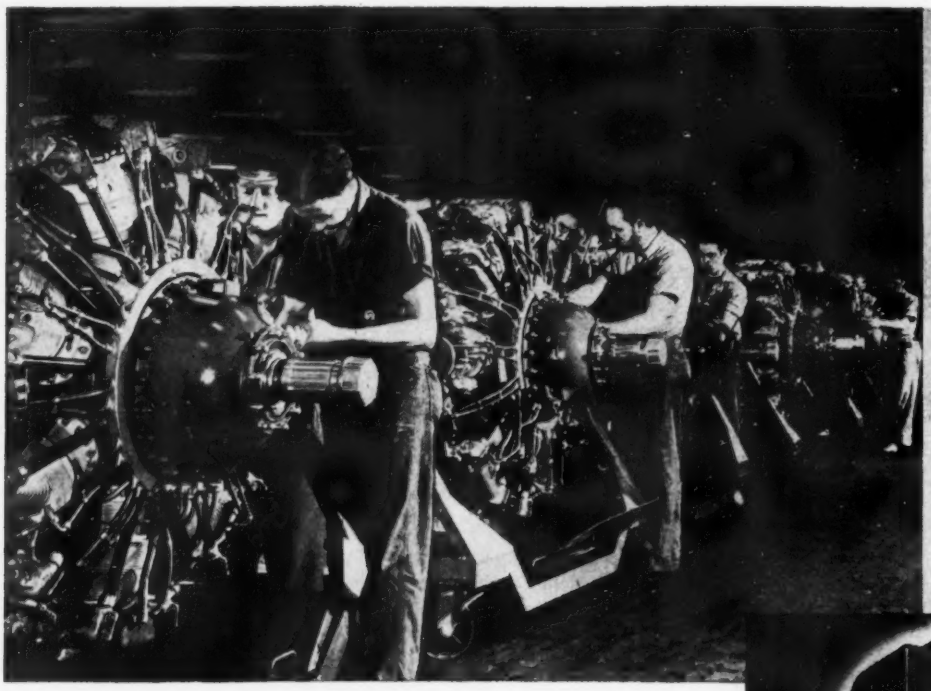
Vertical Boring and Turning Machines in single column types from 30" to 42" and double column up to 10 feet.

The KING MACHINE TOOL Company

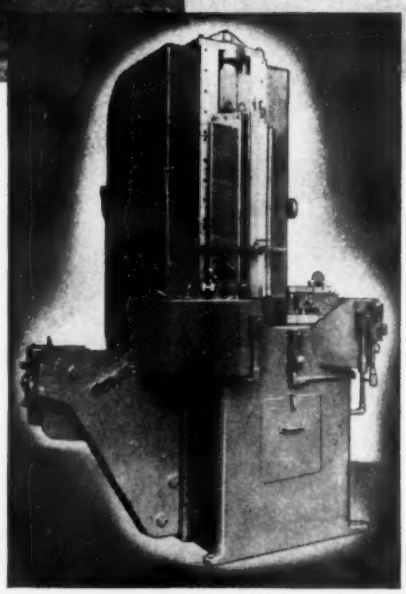
BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

CINCINNATI, OHIO

LINES BEHIND THE LINES



FROM PRODUCTION LINES TO FIRING LINES, IN WAR AS IN PEACE, THE AUTOMOTIVE INDUSTRY DELIVERS THE GOODS

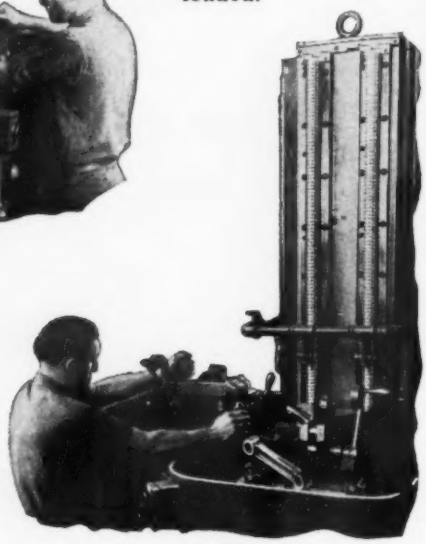


FAST PRODUCTION with high finish is obtained by broaching sides of articulated rod for aircraft engine, shown in position (left) on *American* SB-48-15-2 Single-Dual Machine.

NO INDUSTRY has gone more "all out" for war than the automotive. None manufactures a greater amount or variety of war matériel. For many years the industry has relied on broaching as a better way to do many metal-working jobs—the only *right* way to do some!

* * *

RELATIVELY LOW COST Single Ram Machine performs two different surface broaching operations. One tool (left) broaches flat on rod, while second fixture is being loaded.



RADII ARE FINISHED (right) with second broach while first fixture is being re-loaded. One operator plus one machine plus tooling by *American*—equals a precision job at a production rate!

BROACHING IS BETTER THE *American* WAY

American

BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILL. U.S.A.

Union TOOLS

FOR WAR JOBS THAT MUST BE *Right!*

Tough jobs, "fussy" jobs, unusual jobs of war production — Union will take them all on and produce results that meet today's urgent demands for speed, accuracy and tool economy. Tools for war production must be chosen with care. Try UNION Tools on the war jobs that must be RIGHT— and we're sure they'll become the Tools You Buy Again for every job.

UNION TWIST DRILL CO.
ATHOL, MASS.

S. W. Card Mfg. Co. Div., Mansfield, Mass.
Butterfield Div., Derby Line, Vt.
Butterfield Div., Rock Island, Quebec.

STORES

New York: 61 Reade St.
Chicago: 11 So. Clinton St.
Detroit: 6540 Antoine St.
San Francisco: 121 Second St.
Los Angeles: 524 E. Fourth St.
Seattle: 568 First Ave., South

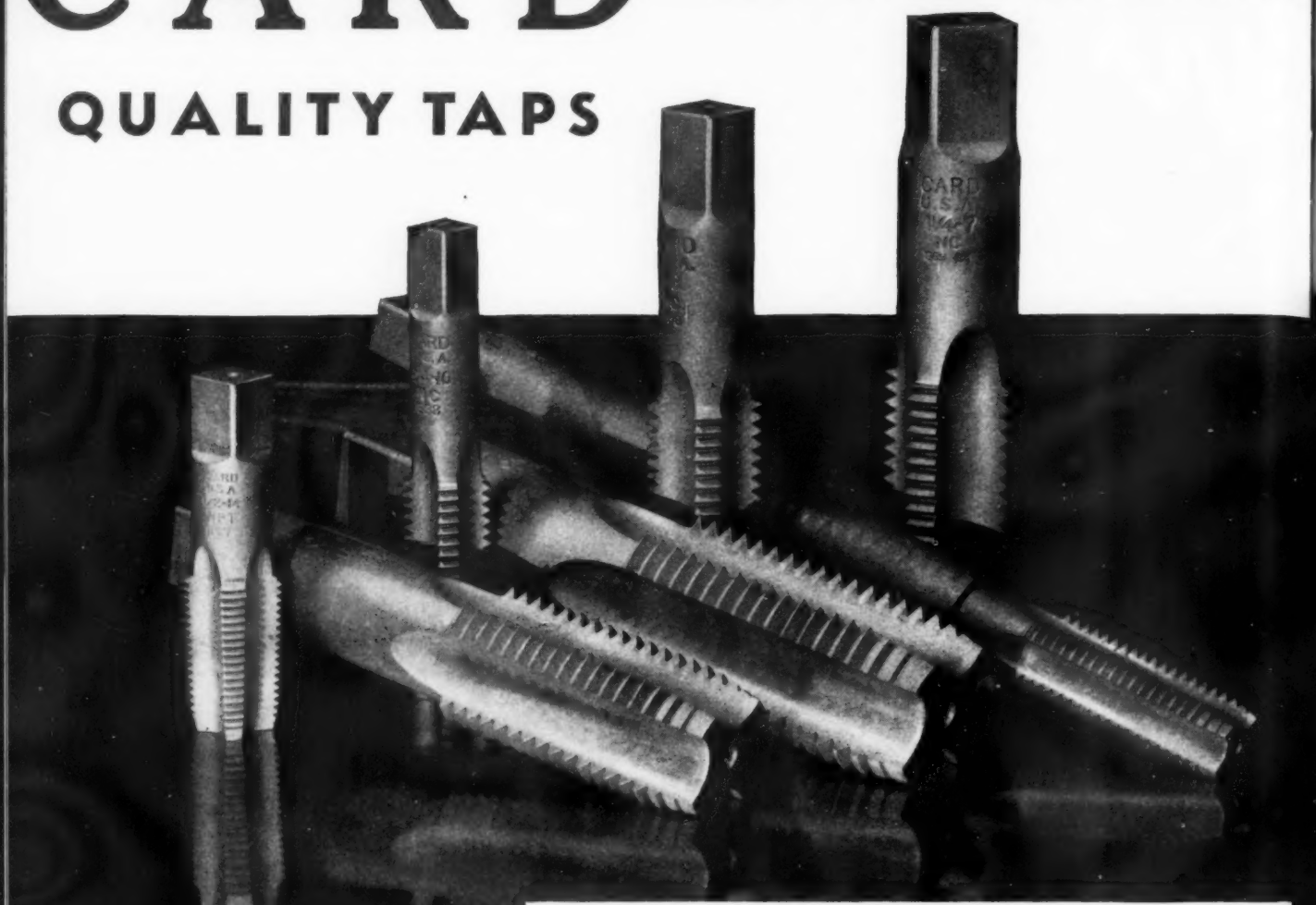
Divisions of the UNION TWIST DRILL CO.

UNION BUTTERFIELD CARD

CARD

FOR WARTIME SERVI

QUALITY TAPS



Under present demands for quantity production, quality must be maintained! When the pressure is on to turn out more and more war materials, Card Taps reveal their inherent ability to turn out high quality work on a high production basis. Whatever degree of accuracy you demand . . . whatever material you work in, Card can supply the Taps for quality war production.

Divisions of the

UNION TWIST DRILL CO.

S. W. CARD MFG. CO.

MANSFIELD, MASS.

STORES

New York: 61 Reade St.
Chicago: 11 So. Clinton St.
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Seattle: 568 First Ave., South

UNION BUTTERFIELD CARD

FOR A LONG LIFE OF PRECISION

Today, small tools must **last!** Tried under rigorous conditions of aircraft manufacture, tested in all branches of munitions work, Butterfield Taps and Reamers are proving their accuracy — their **long lasting** accuracy. Under some of the toughest conditions ever encountered in metal-working, Butterfields have lived up to every claim we make for them. Choose them for your precision wartime threading jobs.

Butterfield

TAPS and REAMERS

UTTERFIELD DIVISION
ERBY LINE, VT. **ROCK ISLAND, QUE.**

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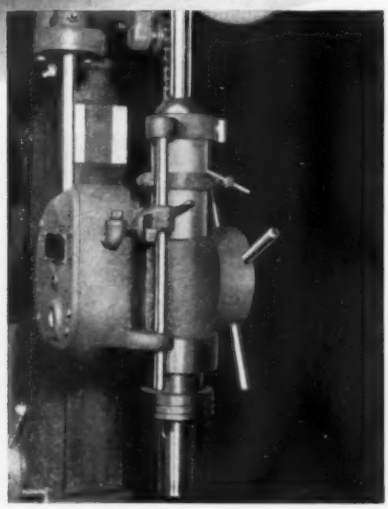
Divisions of the
UNION TWIST DRILL CO.

UNION BUTTERFIELD CARD

A Complete SENSITIVE DRILL

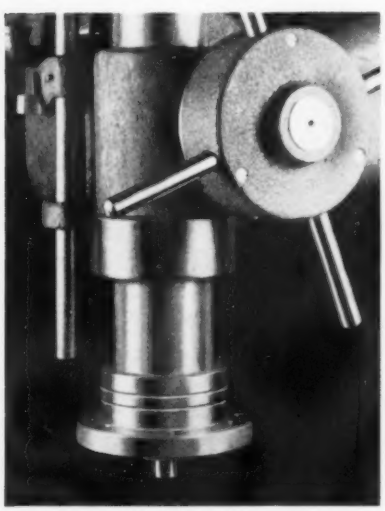
BACK GEAR UNIT

Provides four additional speeds with low of 185 RPM for counterboring and drilling in tough steels. May be used in combination with power feed.



POWER FEED ASSEMBLY

An easy-to-use and efficient power feed that considerably increases production on certain types of drilling and reaming work.

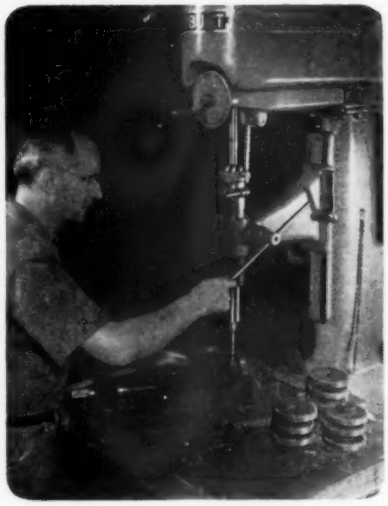


FLANGED TYPE QUILL

A neat, short drive available for use with multiple spindle heads. Will increase production on light operations on small layouts of holes.

TAPPING ATTACHMENT

A built in feature available for production tapping work. Will pull taps up to 5/8"-11 pitch in mild steel. Spindle may be used for drilling by disconnecting attachment.



● Footburt Sensitive Drilling Machines help you meet those new production schedules needed to win the war. They are full range machines and are built in sizes to meet most small drilling requirements.

Spindle speeds from 185 RPM to 3450 RPM available on the No. 2 Machine. Made in 1, 2, 3, 4 and 6 spindle models. No. 3 machines have capacity up to 1¼" in cast iron.

Power feed, back gear, built in tapping and coolant furnish all the necessary attachments. Footburt Sensitives are rigidly built to drive cutting tools to their full capacity. Write for price and delivery information.

THE FOOTE-BURT COMPANY
CLEVELAND, OHIO
Detroit Office: General Motors Building

FOOTBURT *Sensitive* DRILLING MACHINES

Silent PARTNER

FOR FASTER, STRONGER, RESISTANCE WELDING

VITAL MATERIALS SAVED

Eliminates rivets. No flux or solder required.

INCREASED PRODUCTION

Fewer welds are necessary when all are of uniform strength. Less preparation and finishing required.

FEWER REJECTS

Accurate control of timing eliminates weak welds and burned material.

Electronic control is a natural partner for resistance welding. It gives micro-accuracy in the variables that go into making strong, precision welds—weld time and heat. It controls high currents noiselessly, efficiently.

Westinghouse supplies all the necessary equipment for electronic control of resistance welding. Two typical units are illustrated above, mounted on a spot welder.

1 **WELD-O-TROL** "makes and breaks" heavy welding currents as high as 10,000 amperes with no arc, no noise. Complete absence of moving parts eliminates the noise and maintenance of mechanical contactors.

2 **AUTOMATIC WELD TIMER** controls duration of weld and sequence of electrode operations. Precision control to within one cycle or 1/60 of a second produces welds of uniform characteristics—even in mass production.

Specify Westinghouse controls to improve both production rates and consistency of weld quality. Ask your Westinghouse representative for recommendations and descriptive literature. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N.

J-21274

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

RESISTANCE WELDING CONTROLS

How to spot tool troubles

that interfere with production

Just when everything is humming on the production line — wham! — a vital die or tool that had performed perfectly a moment before lets go. Quickly a hand reaches for the switch to cut off power — and a valuable production unit stands idle.

Such sudden interruptions — even short ones — are the bugbear of war-sped production lines. What happened? What went wrong? How can it be corrected?

This may help you find the Answer...

"Trouble shooting" tool failures—how to find what's wrong and correct it—how to spot tools that might *look* all right, but may cause unnecessary shutdowns—are discussed in Chapter 18 of "Tool Steel Simplified". Photographs of tools that failed in service are shown. You are told *why* they failed, *how* their failure could have been *prevented*—how to prevent many tool troubles.

But the chapter on "trouble shooting" is only one of many ways in which "Tool Steel Simplified" brings you helpful, practical information that you can use to prevent premature tool failures. Chapter after chapter, subject after subject, it gives the sort of down-to-earth working data you can put to use to get better tool performance, longer production runs. It covers tool steel selection, tool making, heat treating, quenching, furnace atmosphere, testing—the whole tool steel picture—in easy-to-read everyday shop language.

You can start right here to see how useful "Tool Steel Simplified" is—how helpful it can be as a handbook for use in your shop or tool room. See the opposite page.

More than 35,500 copies of "Tool Steel Simplified" are now being used in plants like yours to train new men, "up-grade" older hands, save time, trouble shoot—get better and faster production.

The Carpenter Steel Company, 109 Bern St., Reading, Pa.

How to "trouble shoot" tool failures

The term "trouble shooting" has been aptly applied to the business of trying to find out why something went wrong. A good trouble shooter must be open minded and unprejudiced. He cannot first make up his mind what he "hopes" the trouble is—and then set out to prove he is right. Furthermore, he must be well informed on his subject. Possession of the knowledge contained in "Tool Steel Simplified" would automatically make a tool maker a reasonably good trouble shooter on tool failures. Discussed below are a few of the tips contained in the chapter on trouble shooting.

Spalling in Service—Tools like header dies, coining dies, striking dies and embossing dies which are under heavy pressure must usually be made from a surface hardening tool steel. If they are made from a tool steel that hardens clear through, they are likely to split—they need the reenforcement of a tough core in order to hold together. If the hardened case is *too shallow* for the pressures involved, it will cave in like thin ice. This sinking action frequently progresses slowly — but eventually a chip will come loose and this is known as spalling. An example is shown in Figure 1.

FIG. 1

The remedy for this is to use a higher hardening heat, or a flush quench, or both, to drive the hardness penetration deeper. Failing in this, use a steel having slightly deeper hardening characteristics.

Heat Checks—In the red-hard tool steels used for hot forming operations, the working surface of the tool will frequently become crazed with a pattern that is suggestive of grinding checks. When a tool is in contact with the heated work, it is suddenly heated. If a liquid coolant is used, the minute the hot forging is removed the surface is rapidly chilled. This process is repeated many times and finally the surface starts to heat check. A badly checked hot drawing mandrel is shown in Figure 2.

FIG. 2

Heat checking can be greatly helped by not employing so violent a coolant. A stream of water can be replaced by an air blast. Also, a tool that has been drawn back far enough to have some ductility will resist heat checking better than a harder tool.

Grinding Checks—Grinding checks so fine that they cannot be seen with the naked eye can so weaken a tool that it may later fail in service. Figure 3 shows a tool with grinding checks that has been boiled in acid to make them visible. If this tool were to fail as a result of grinding checks, the edge of the fracture would follow the path of some of the checks. This makes a characteristic jagged edge to the fracture which should immediately suggest grinding checks. Boiling the tool in acid will make them visible.

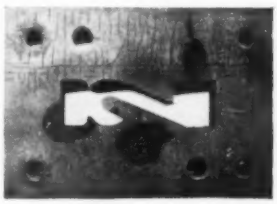


FIG. 3

Obviously, all grinding checks are not the fault of the grinder. If he receives a poorly hardened and poorly drawn tool that is almost ready to fall apart when he gets it, he cannot grind it successfully, no matter how careful he may be. On the other hand, it is so easy to hog into the work on the roughing cuts that many good tools are ruined in grinding.

Note: In trouble shooting, never anneal a failed tool for hot acid inspection or any other purpose until all necessary investigations have been made in the hardened condition. Much valuable evidence may be lost in the anneal.

Machining—It is well to be suspicious of tools from which large amounts of metal have been cut, and those that have deep, sharp stamp marks. In case of doubt, it is better to be on the safe side and give such tools a strain relieving anneal before hardening them. Figure 4 shows a pneumatic chisel that failed in service from fatigue that started in a deep stamp mark.

FIG. 4

"Tool Steel Simplified" 315 pages, 205 illustrations. Available at cost in the U.S.A.—$1.00 a copy ($3.50 elsewhere).

This is only part of the information contained in *one* chapter of "Tool Steel Simplified". Put *all* its useful facts on many subjects to work for *you*—right in your tool room. Order copies for the tool room men you want to train—for your "trouble shooters"—today.

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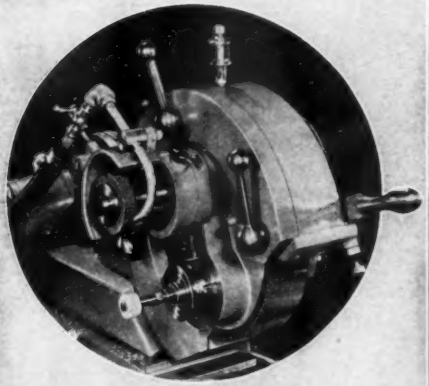
104 INT.-EXT. GRINDER

For Small Hole, Cylindrical and Concentric Grinding

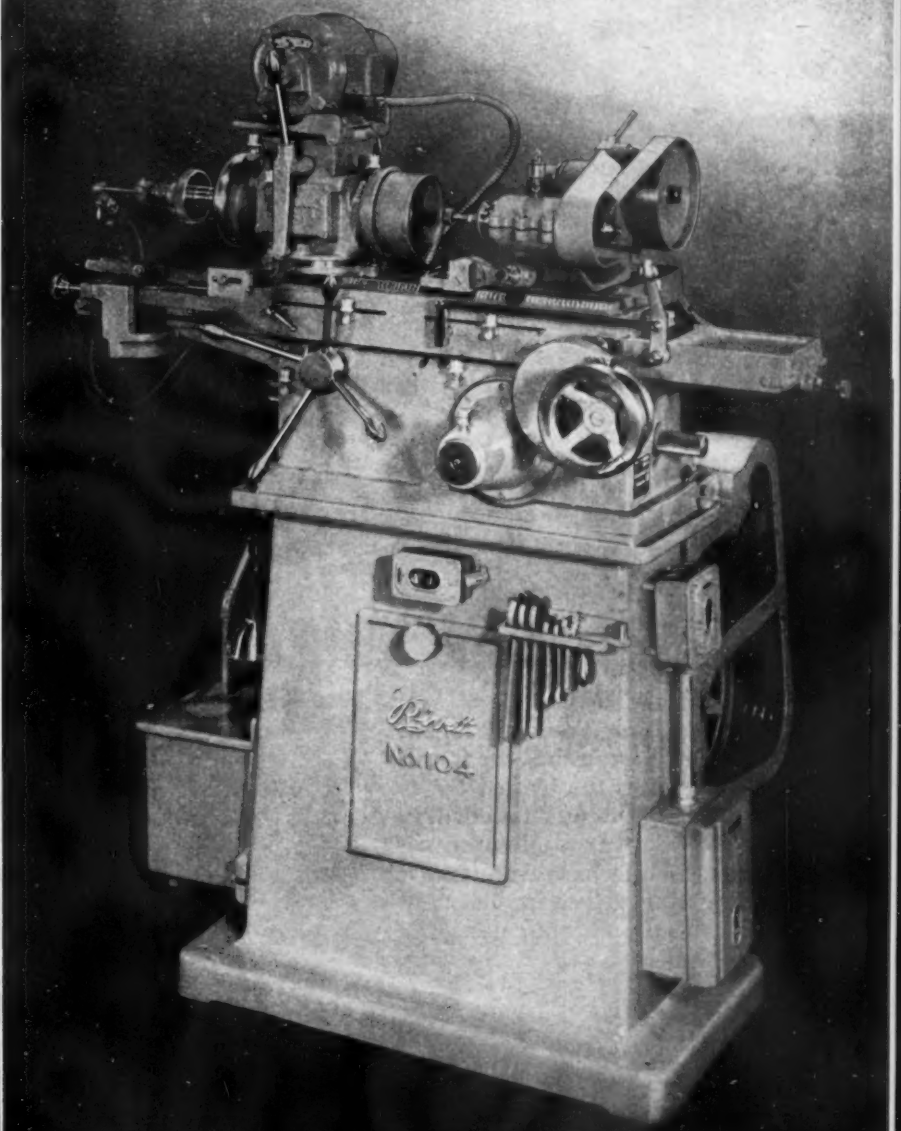
The Rivett No. 104 is a simple, accurate grinder suitable for die and tool making as well as precision manufacturing. Its ease of set-up and operation, and its selective spindles make it an efficient machine for internal and external grinding. The internal or external grinding spindle bracket may be selectively mounted on cross slide as desired. For special work requiring concentric grinding of internal and external surfaces at one chucking, turret carrying both internal and external spindles may be used.

Work may be held in collet, step chuck, jaw chuck or fixture or on centers when using external spindle with tailstock. Power table reciprocation has three speeds from 54 to 126 passes per minute. Length of table travel is infinitely adjustable between ¼" and 2" or ½" and 4" depending on range selected.

External Spindle and Tailstock



Internal and External Spindles in Turret

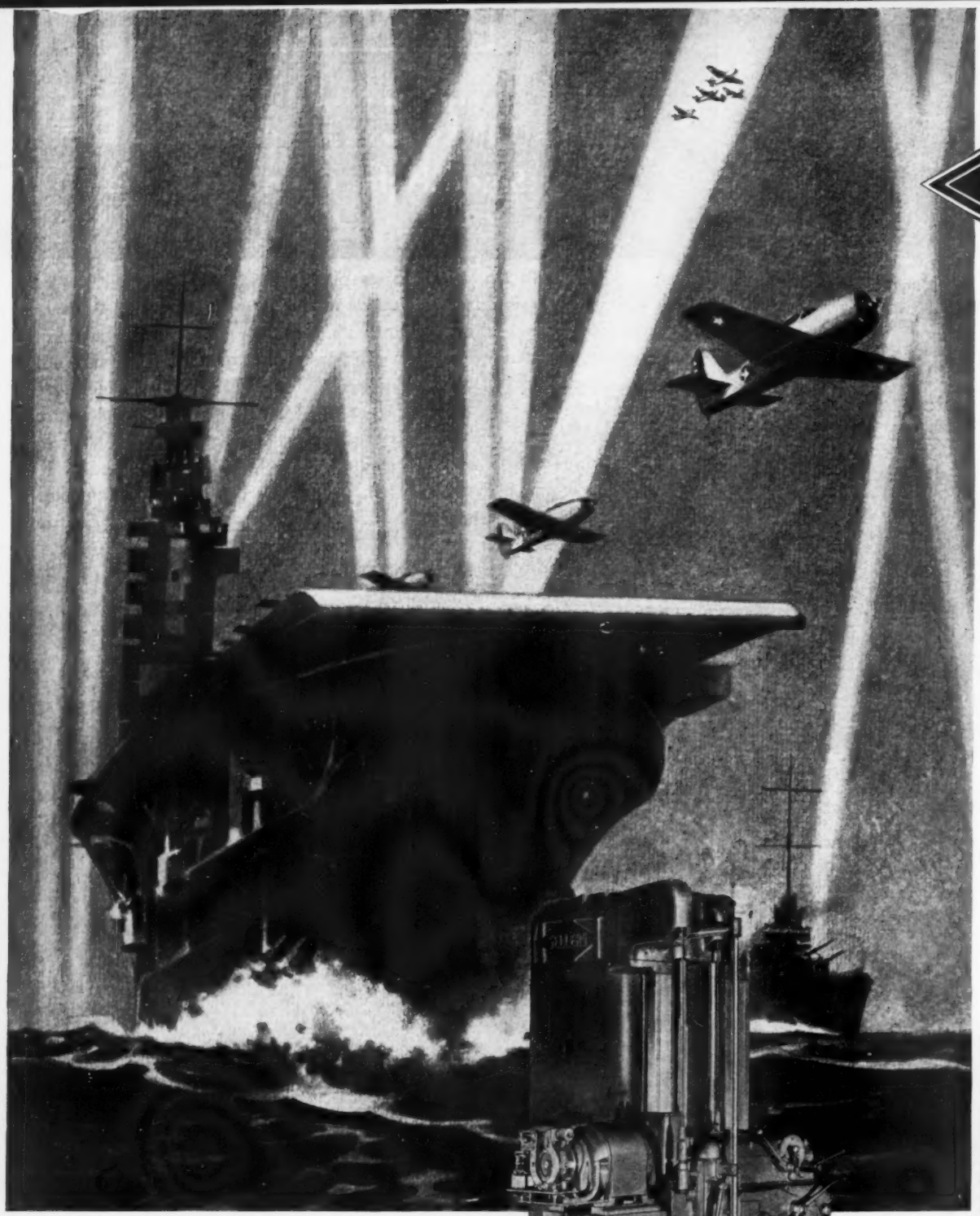


SPECIFICATIONS

Grinding cap., hole dia.	up to 3"
Grinding cap., outside dia.	up to 3"
Automatic table travel	
Standard	¼" to 2"
Special	½" to 4"
Hand table travel	11"
Swing over table	8"
Center distance	8"
Workhead swivel	90°
Table swivel	5°
Cross feed graduations	
Standard	.0005"
Special	.0001"
Travel of cross slide	1¾"
Collet capacity	⅞"
Step chuck capacity	6"
Jaw chuck capacity	6"
Workhead spindle speeds	200, 375, 600 r.p.m.
Grinding spindle speeds:	
Standard int.	21000 and 25000 r.p.m.
External	3800 r.p.m.
Net weight with motors	1750 lbs.

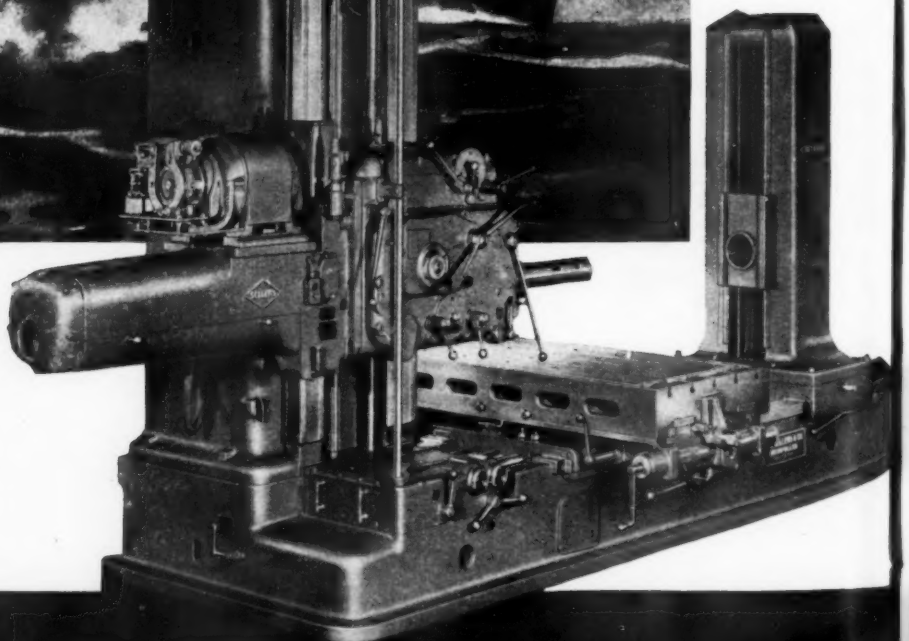
For Further Description Write for Bulletin 104

RIVETT LATHE & GRINDER INC.
BRIGHTON BOSTON MASS



FOUNDED SELLERS 1848

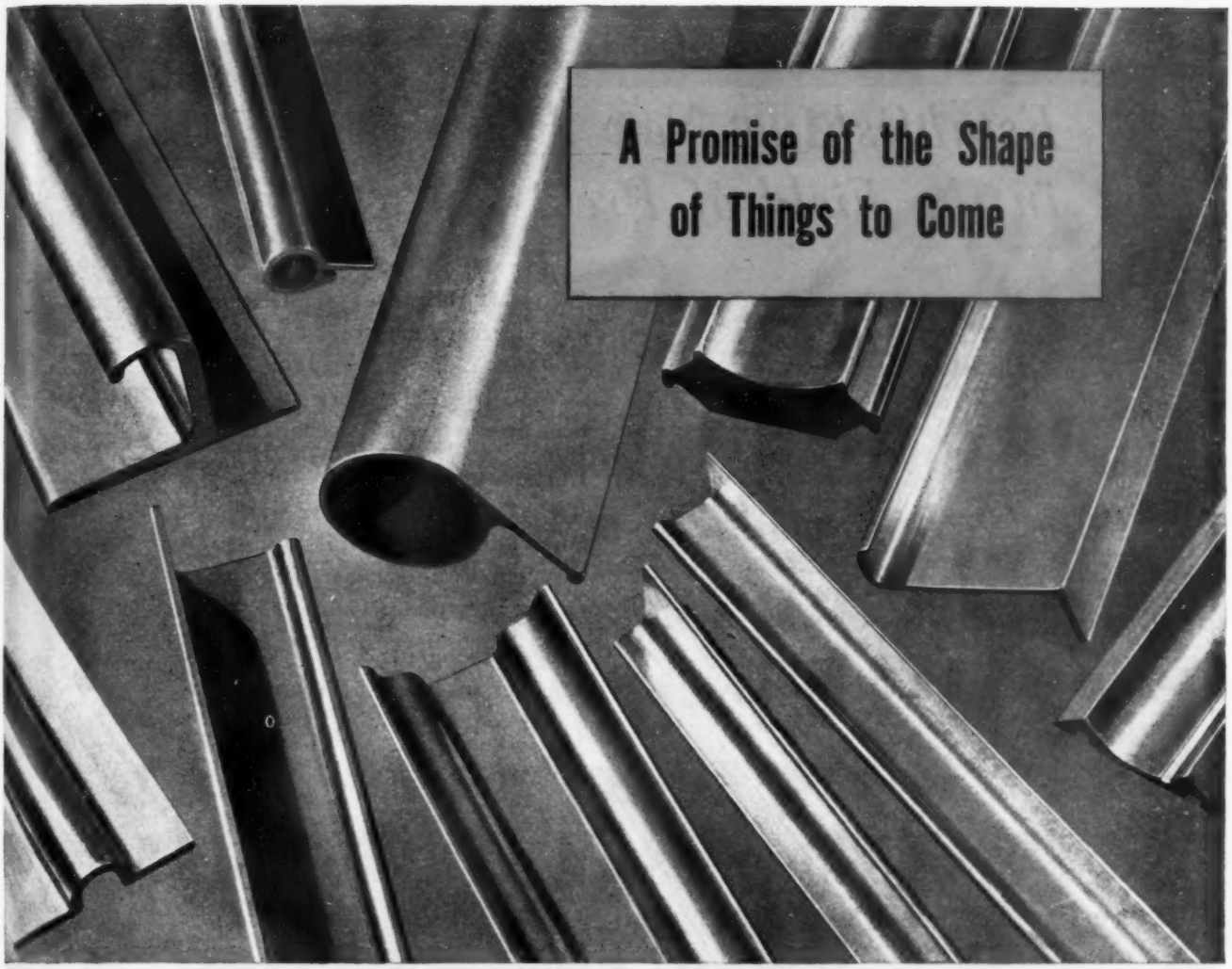
Below is shown a 5" Table type Sellers Horizontal Boring, Drilling and Milling Machine.



SELLERS Machine Tools are again playing their part in this, the fourth major war involving the United States since the Sellers firm was founded in 1848. No former war depended on machinery as much as has this one: that Sellers tools are needed so urgently and in such quantities is an obligation that Sellers workers have accepted as a duty.

Sellers

WILLIAM SELLERS & CO., Inc.
Philadelphia Penna., U. S. A.



They're weight savers, these Mazlo Magnesium extrusions. Such shapes supply strength and stiffness to fighting equipment, while holding weight to a minimum. They're an indication of the ways designers of postwar products will be eliminating excess weight.

The extrusion process has the advantage that it places metal exactly where needed. A heavy section here, less metal there; each piece does the mechanical job demanded of it. And, usually, very little machining is needed to get it ready to go to work.

For over twenty years, American Magnesium Corporation engineers have been helping manufacturers use magnesium extruded shapes to best advantage. Many a war plane is a better fighter today because this experience was available to its designer. You'll have that experience to turn to when you again take up peacetime production... Sales Agent for Mazlo Magnesium Products: Aluminum Company of America, 1709 Gulf Building, Pittsburgh, Pa.

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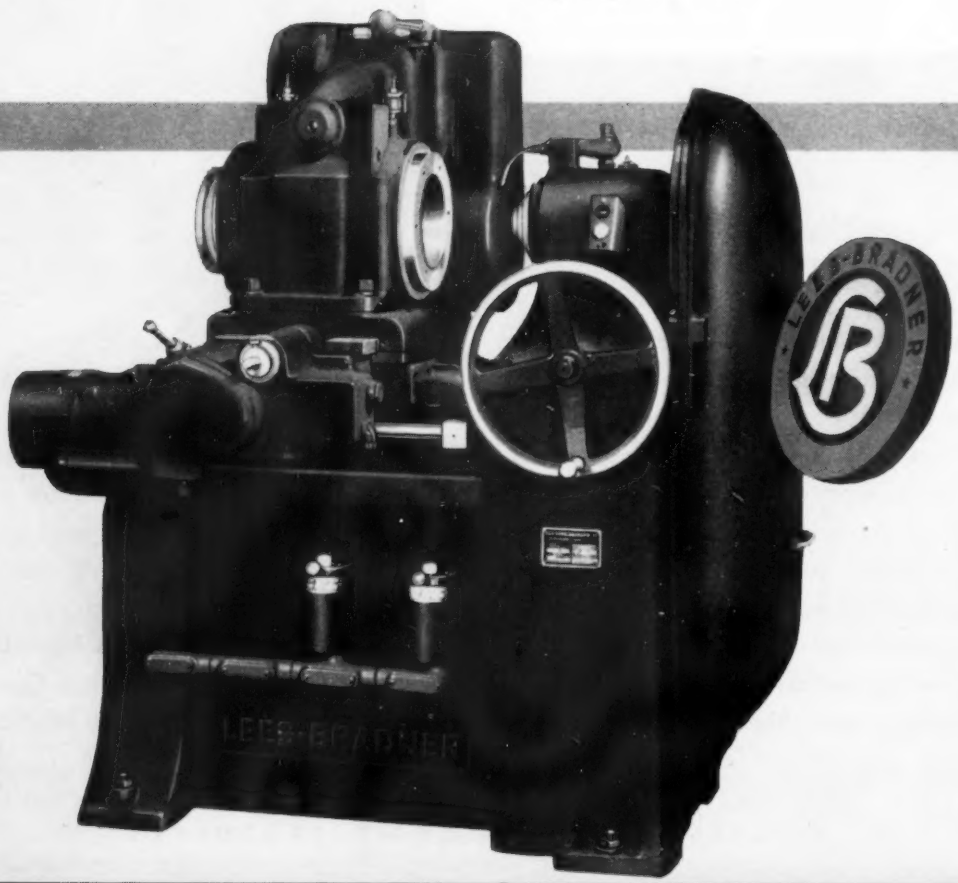
Model 40 Automatic

THREAD MILLER

Out of Lees-Bradner's vast store of experience in the design and construction of thread milling equipment comes the Model 40 for the mass production of precision threads.

Rugged, accurate, and sturdy this L. B. Thread Miller is so simple to operate that with minimum instruction unskilled labor is quickly taught to produce superb threads.

Why not consult a Lees-Bradner engineer on your precision threading requirements?



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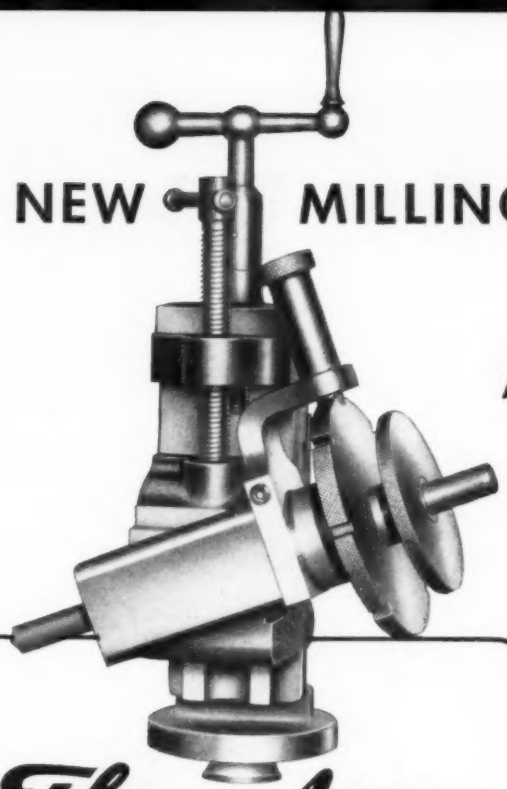
. A NEW MILLING FIXTURE WITH

Fool Proof INDEXING



Thompson
UNIVERSAL
MILLING
FIXTURE

Set this time saver up on any bench lathe — slip on a stock index plate — and the most inexperienced operator can produce indexed work with no chance for error through miscalculation.

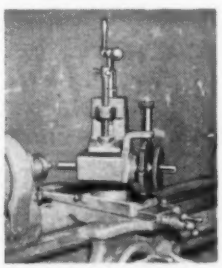
The 3-way swing provides exceptional maneuverability, so that it readily produces a wide variety of end mills, special cutters, reamers, splines and punches. Plain milling of flat stock may also be accomplished by using the sturdy vise without indexing unit.

Awarded to AUTO-ORDNANCE CORPORATION for excellence in production of "Tommy Guns."

ex Fixture tilted at 30° mill- end teeth in Taper Reamer.

Fixture and Base at right angles milling straight teeth in cutter.

of Fixture on 30° angle ng end teeth in cutter.



End Mill operation showing work extended thru fixture.

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AUTO-ORDNANCE Corporation

THOMPSON TOOL DIVISION

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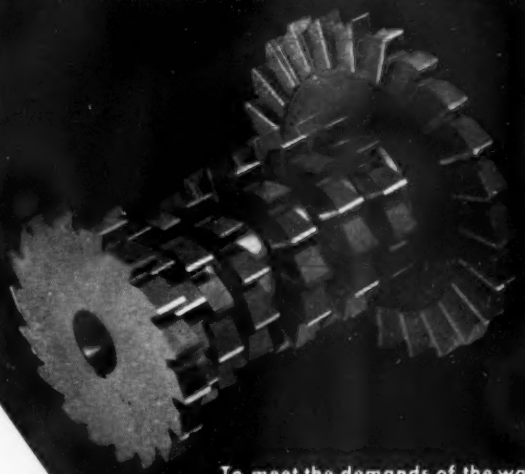
"SPECIALS" ON TIME

C&W TOOLS

C & W
SPECIAL PRECISION CUTTERS



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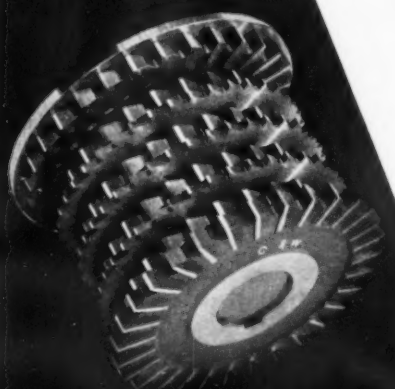
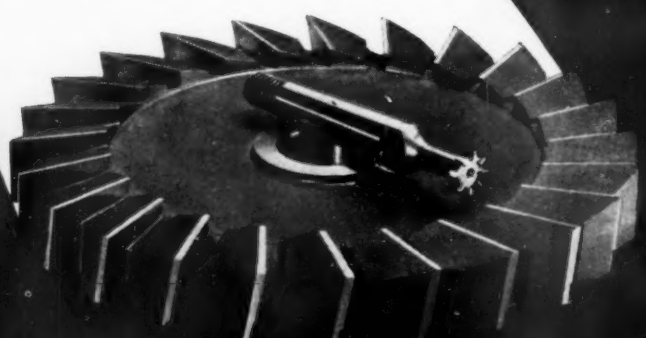
To meet the demands of the war program — ON TIME — C & W is constantly expanding plant capacity. C & W is one of the largest producers of special high-speed precision cutting tools — and has an outstanding record in meeting promised delivery schedules.

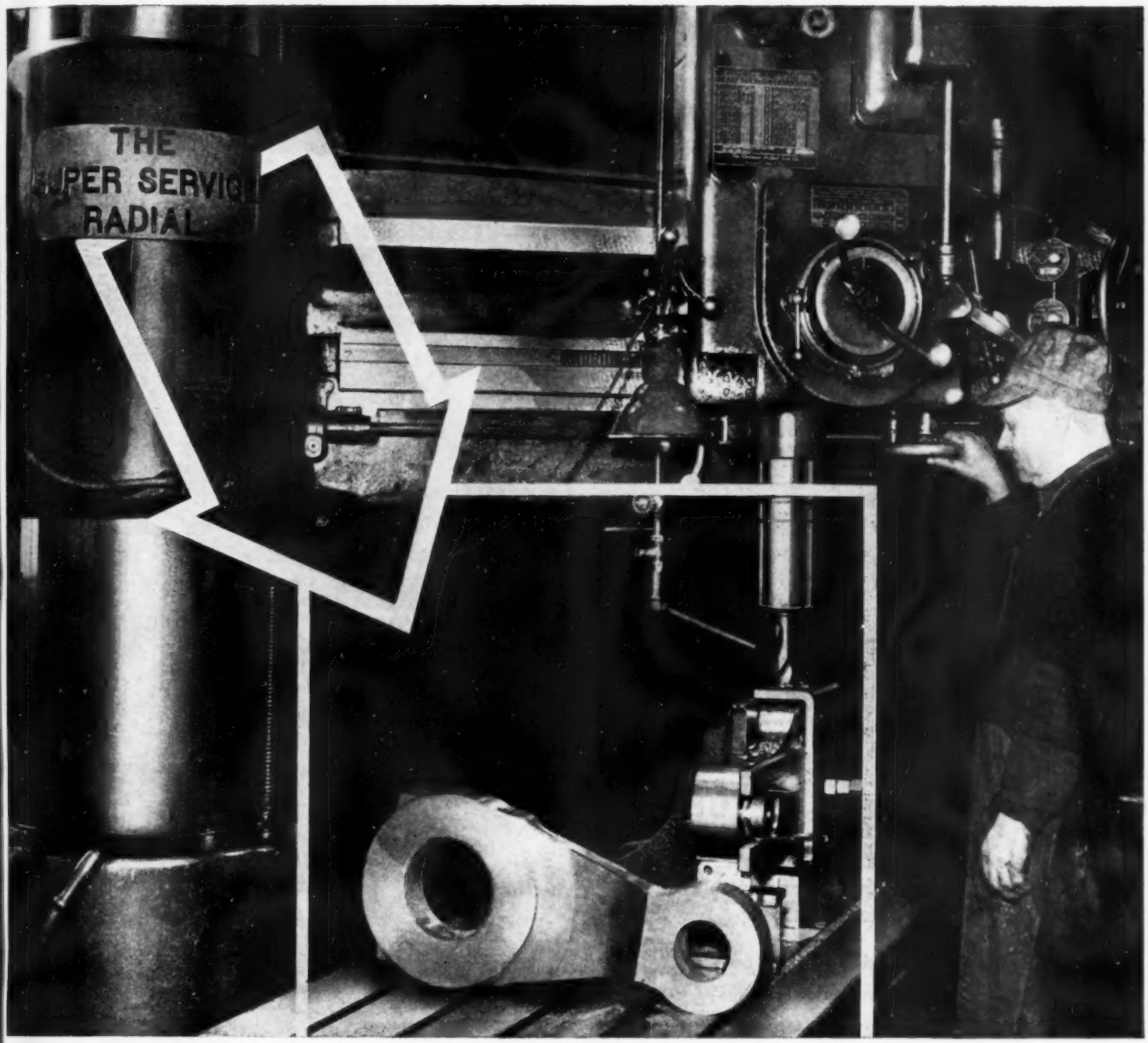




Write for illustrated pamphlet— Consult us on your tool requirements.

C & W TOOL COMPANY

FOR OVER THIRTY YEARS QUALITY PRECISION CUTTING TOOLS



Another VITAL Application of the SUPER SERVICE RADIAL...

RAILROAD PRODUCTION

CINCINNATI BICKFORD ENGINEERING SERVICE IN THE INTEREST OF VICTORY

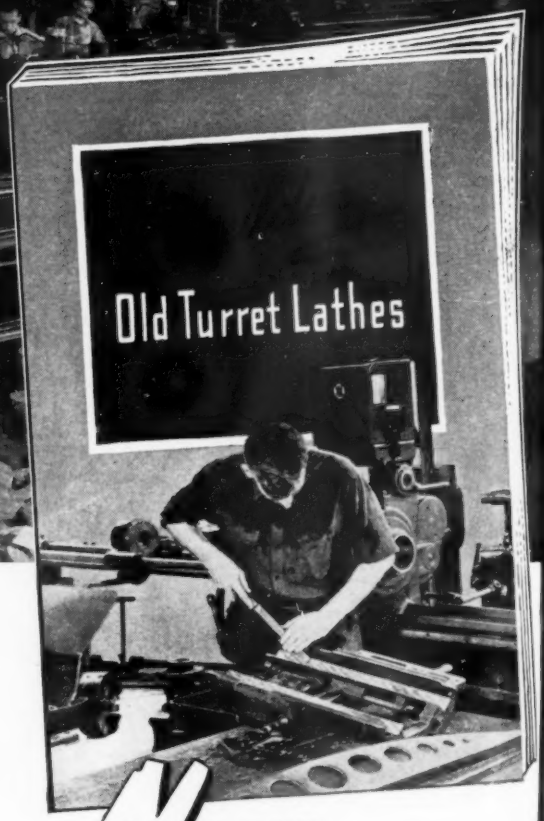
The Cincinnati Bickford Tool Co. is now developing drilling machines that produce victorious results and will continue to hold those high standards for many years to come. The Engineering Staff is not satisfied to rest on laurels that won their Super Service Metal Drilling Machines the slogan of More Holes per Dollar, but they are ever searching for improvements that will continue to keep the Cincinnati Bickford Tool Company's name in that category of one who builds machines that drill MORE HOLES PER HOUR.

ARMY E NAVY
AWARDED SEPT 10, 1942

Drilling to close parallelism is an important operation at the American Locomotive Company Plant. The parts so drilled are eccentric cranks which are to be bolted to main crankpins. Long holes are required; specifications call for drilling these holes closely parallel to the vertical center lines passing through both bearings. The machine used for this precise operation (illustrated above) is the **Cincinnati Bickford Super Service Radial with numerous features to insure consistently accurate performances in the high speed production of numerous vital products needed for America's gigantic Victory output.** Write to Cincinnati Bickford for detailed information on all models of Super Service Radials and Upright Drills.

THE CINCINNATI BICKFORD TOOL CO. OAKLEY, CINCINNATI, OHIO, U. S. A.

To Help You Maintain Fast, Accurate Production In Your Turret Lathe Department



This New Manual Tells How to Recondition Old Turret Lathes

ARE your older turret lathes producing to the limit of their original capacity? Most shortcomings of old, worn turret lathes can be learned by these six questions:

1. **Does the machine duplicate sizes?**
2. **Does the machine produce chatter?**
3. **Do finished surfaces show gear tooth marks?**
4. **Does the cross-slide face and cut off square?**
5. **Do reamers and counterbores cut properly?**
6. **Does the machine cut taper with tools held in the hexagon or square turrets?**

A hasty fix-up is no solution to these difficulties; nor can a completely rebuilt *old* turret lathe compare with a modern model, but a careful reconditioning of a turret lathe which has seen years of service can restore its original speed, power, and accuracy. This new booklet shows you how this may be done.

New 32-PAGE BOOKLET

illustrated with actual rebuilding photographs and diagrams, explains reconditioning procedure in detail. It is presented in such a way that when only a partial reconditioning is necessary, the instructions are easily followed.

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IT'S FREE! USE THIS HANDY COUPON

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Please send booklet "How to Rebuild Old Turret Lathes" to

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YOU CAN TURN IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

WHAT'S IN THIS ISSUE

J. T. HESS

HOBS REQUIRE DETAILED CARE

Life-long statistics based on regular inspection and checking for accuracy are necessary for hobs used in the precision machining of marine reduction gears. Procedures to be followed and forms to be used in maintaining a statistical record of each hob are described and illustrated, along with tolerances for various sizes and methods of sharpening, in an article by J. T. Hess, general foreman, Gear Department, General Electric Company. Page 83.

MACHINE LAPPING SAVES LABOR

Hand lapping of a heavy cylinder-bank assembly was hard and monotonous work, and it was difficult to keep men on the job. Efforts were made to devise means of converting to a machine operation, but experts held out little or no hope of the chance of attaining a satisfactory solution. However, the plant repair department took hold of the problem, licked it, and now labor on this operation has been reduced 89 percent, production increased 69 percent. The apparatus they adapted and originated is described and illustrated. Page 92.

THE DRILL PRESS

Thousands of men and women are today working in factories who previously did not know how to drive a nail or tighten a bolt. To mold these workers into a smoothly operating corps of production soldiers, has been one of the problems of industry during this period of rapid expansion. It is the purpose of the series of training aids, entitled "Tools of Our Trade," to take the worker fresh from the streets and get him or her into production with the barest minimum of training. The portion of the series published in this issue describes a drill press, tells what it is, how it operates, what it can do. Page 97.

WHAT OF SURPLUS TOOLS?

Months of intensive effort to outproduce the Axis have brought machine tool production to ten times the normal output. With thoughts of the peace to come tantalizing the minds of everyone, machine tool builders are wondering whether they have produced a reservoir of equipment that war's end will release upon the market as a flood of used tools. J. R. Porter's article (*AM*—March 4, pp. 97) suggesting a solution has inspired letters of comment. Page 89.

TO EXPEDITE PRODUCTION

An elliptical compass will layout intersections between cylindrical objects, planes and warped surfaces with the accuracy and accuracy of a compass scribing a circle.

A specially designed fixture makes it possible in one setting to check any quantity of any one size of gear for accuracy.

These are typical War-Winning Suggestions made by workers, and published to spread the knowledge where it will do the most good. Page 122.

SMALL SHOP CONVERSION

The production of metal parts for the war machine is not limited to the mammoth plants hurriedly erected in meadows and cornfields. Small shops with the necessary experience in working to close tolerances are playing an important part in production. How the Anderson Brass Works, formerly engaged in manufacturing bronze electrical distribution connectors, changed to the production of 37-mm. shell is described by E. G. Collins, superintendent of the shell department of that company. Page 113.

E. G. COLLINS

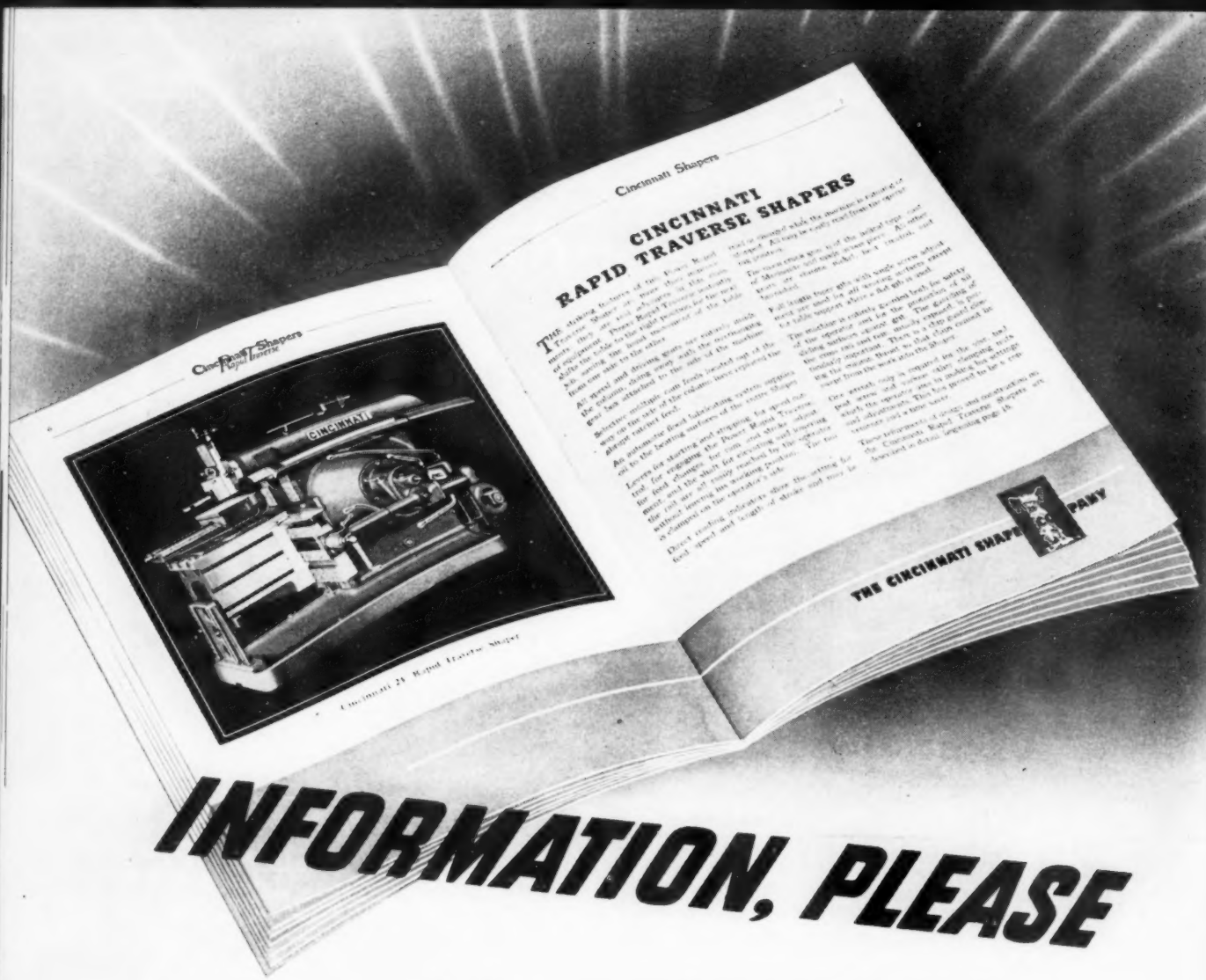
HEAT OVERCOMES WHAT HEAT DID

Flame heating can be utilized to eliminate distortion in welded structural shapes, castings or plate. With this process it is possible to straighten bent shafts or to shrink the interior diameter of sleeves or collars, or to remove warpage in castings. The steps to be followed in utilizing this process are described by C. W. Hale of the Air Reduction Company. Page 91.

COMING

The critical tool supply situation existing in the aircraft industry is further aggravated by the expansion of labor forces with the introduction of hundreds of thousands of untrained workers. To combat the shortage, R. C. Holloway, perishable tool superintendent, Linden Plant, Eastern Aircraft Division, General Motors Corporation, is applying salvage practices previously found successful in the Delco-Remy Division of that organization. Educational campaigns in the shops, to lessen the incidence of tool damage, plus tool salvage campaigns, do much to gain maximum plane production from each tool. Mr. Holloway's article will appear in an early issue.

Satisfactory cleaning of metals in a modern high-production shop can be accomplished only through careful planning. Methods and materials have been developed to clean any part, whatever its substance or condition. Machines can be designed to fit into any stage in the production line. The best solution of any one problem can only be attained by careful consideration of all the factors involved and a wise adaptation of the best materials to the specific situation. In the near future, American Machinist will begin publication of a series of articles, devoted to the planning of a metal-cleaning program to meet wartime needs, prepared by the technical director and chief engineer of an eastern manufacturer of cleaning equipment.



INFORMATION, PLEASE

Today, as ever, Cincinnati Shapers are indispensable in both the large plant and the small shop. Such Cincinnati features as: built in power rapid traverse to the table, multiple cam feeds, direct reading indicators, bring to the user of a single machine or of many machines an outstanding usefulness.

Write for informative book N-2 on the complete line of Cincinnati Shapers.

THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

ESTABLISHED 1877 **AMERICAN MACHINIST** BURNHAM FINNEY, Editor

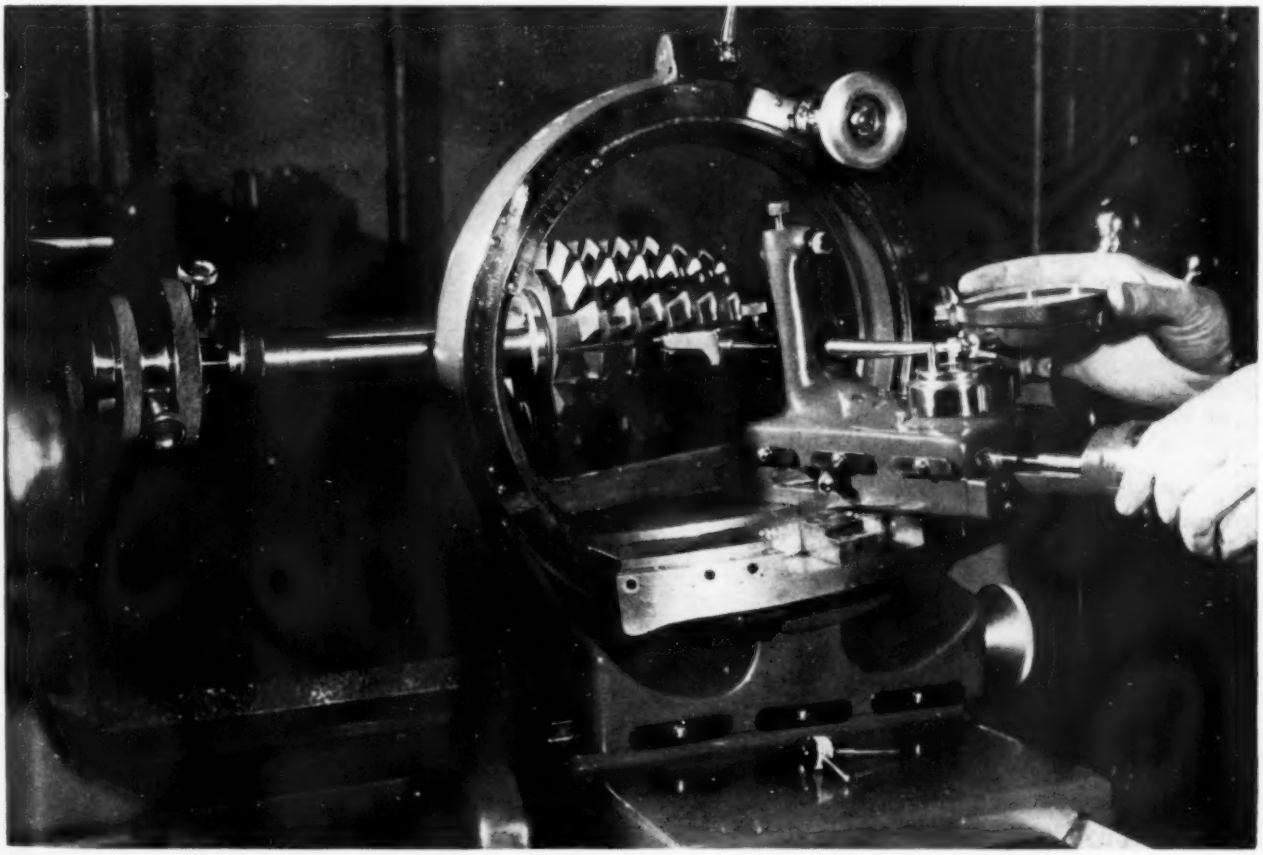
Only From Accurate Hobs

BY J. T. HESS, GENERAL ELECTRIC COMPANY

THE INVOLUTE gear tooth generated on a gear hobber is not a continuous curve, but consists of a series of flats produced consecutively by each of the straight-sided rack-shaped teeth in the working section of the hob. Therefore, it is of utmost importance that each tooth be of the proper shape and do its work at the proper instant in order to produce accurate tooth profiles. This requires that the hobs be precision made, accurately checked, and carefully serviced throughout their useful life.

This is particularly true of hobs for high-speed reduction gears. The various hobs for a wide variety of marine gears manufactured by the General Electric Company are delineated on special drawings showing dimensions and tolerances to be followed by the hob manufacturer. Upon delivery they are sent to a central inspection department where they are completely checked, serial numbered, and recorded on standard forms before final acceptance. These forms, used through the service life of the hobs, are shown in the illustrations.

Tolerances for small-size hobs are



A hob inspection machine is used to check the diameter of hob teeth, hub faces, and hub-datum diameters. The tooth form is checked for variation in the straight portion, and the symmetry of the teeth, the gash angle and lead of the hob over the cutting edges are determined

HOB REDUCTION RWD 10-7200 SERIAL GR 70 PT. 101A

DATE ORDERED NOV. 24, 1941 COST $105.10 DRG. M-1058926-1

DIAMETER	HAND	TYPE	LOCATION RACK	BAR	PIN	DATE REC'D.
4 1/2"	S.L.H.	FINISHER	A	5	3	APR. 6, 1942
DIA. PITCH	5					
N. CIRC. PITCH	.5147"					
PRESSURE ANGLE	16 1/2°					
D + F	.4125"					
BORE	1.750"					
KEYWAY	7/16" x 15/64"					
LEAD OF GASH	311.11"					
ANGLE	2° 20'					
MATERIAL	H.S. 78					
MAKER	UNION TWIST					
ORDER NO.	708-105-017					

Records like these for each hob are made before final acceptance from the manufacturer. They are maintained until the hob is discarded

FRONT

BACK

GRINDING RECORD HOB NO. GR 70

NEW LAND 23/32" AVERAGE GRIND .008" EFFECTIVE LAND 9/16" NUMBER OF AVAIL. GRINDS 70 GEARS PER HOB 70

DATE	AMOUNT	LAND	DATE	AMOUNT	LAND	DATE	AMOUNT	LAND
9-28-42	.006"	23/32"						
10-1	.004"	23/32"						
10-6	.005"	45/64"						
10-29	.005"	45/64"						
12-5	.005"	45/64"						
12-24	.007"	11/16"						
1-31-43	.009"	11/16"						

CHECK OF HOB

TYPE S.L.H. Finisher DRG. M1058926-1 PART 101A SERIAL GR 70 R.W. 10-7200

REMARKS Use to cut Type MD 48-A PREVIOUS R.W. ____

C.P. .5147" P.A. 16°30' THREAD ANGLE 2°20' D+F .4125" MAGNAFLUX O.K.

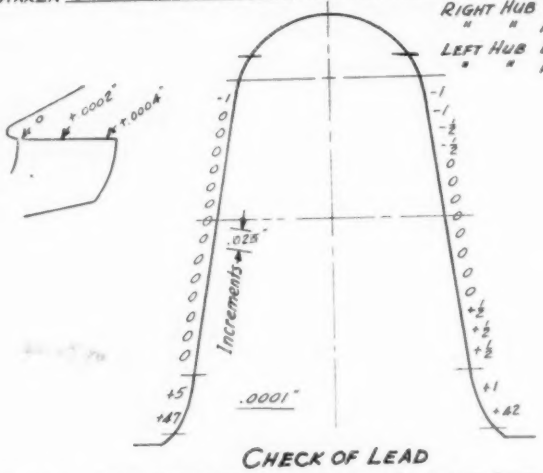
HOB MAKER Union Twist Drill Co. DRG. ADD. .2335" DRG. T.T. .254" T.T. CHECK .253"

RIGHT HUB DIA. RUNOUT = .0001"

" " FACE " = .0001"

LEFT HUB DIA. " = .0001"

" " FACE " = .0001"



CHECK OF LEAD

LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT
0	0	+2	-2	+4	-2										
+2	0	+3	-1	+4	-2										
+2	+1	+3	-1	+5	-2										
+2	0	+3	-1	+5	-3										
+2	+1	+3	0	+5	-3										
+2	0	+3	0	+6	-3										
+2	0	+3	-1	+6	-3										
+3	-1	+4	-2	+6	-4										
+2	-1	+4	-2	+6	-4										
+2	-1	+4	-3	+6	-5										
+2	-2	+4	-3	+6	-5										
+3	-1	+4	-2	+6	-5										
.0003"	.0003"	.0002"	.0003"	.0002"	.0003"										

R.H. LEAD TOTAL .0006"

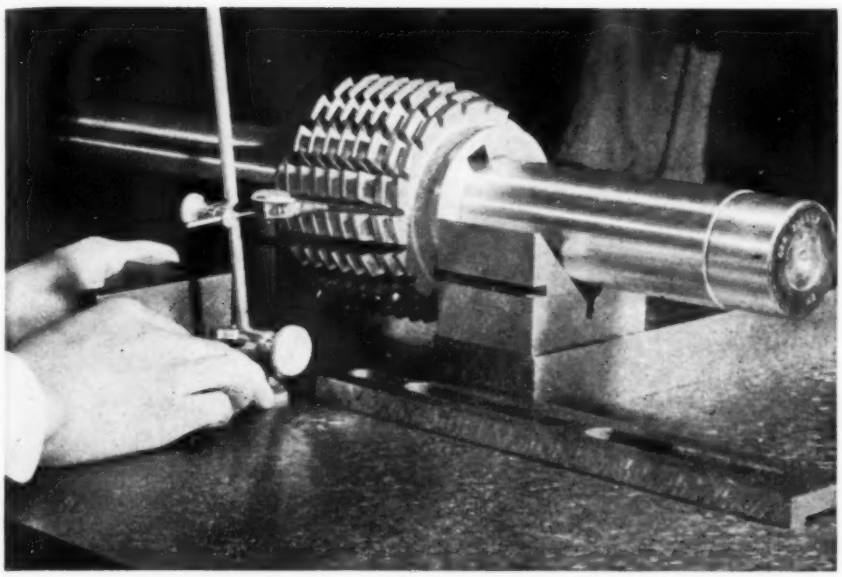
L.H. LEAD TOTAL .0006"

SIGNED. F. M. Plock DATE. Aug. 20, 42

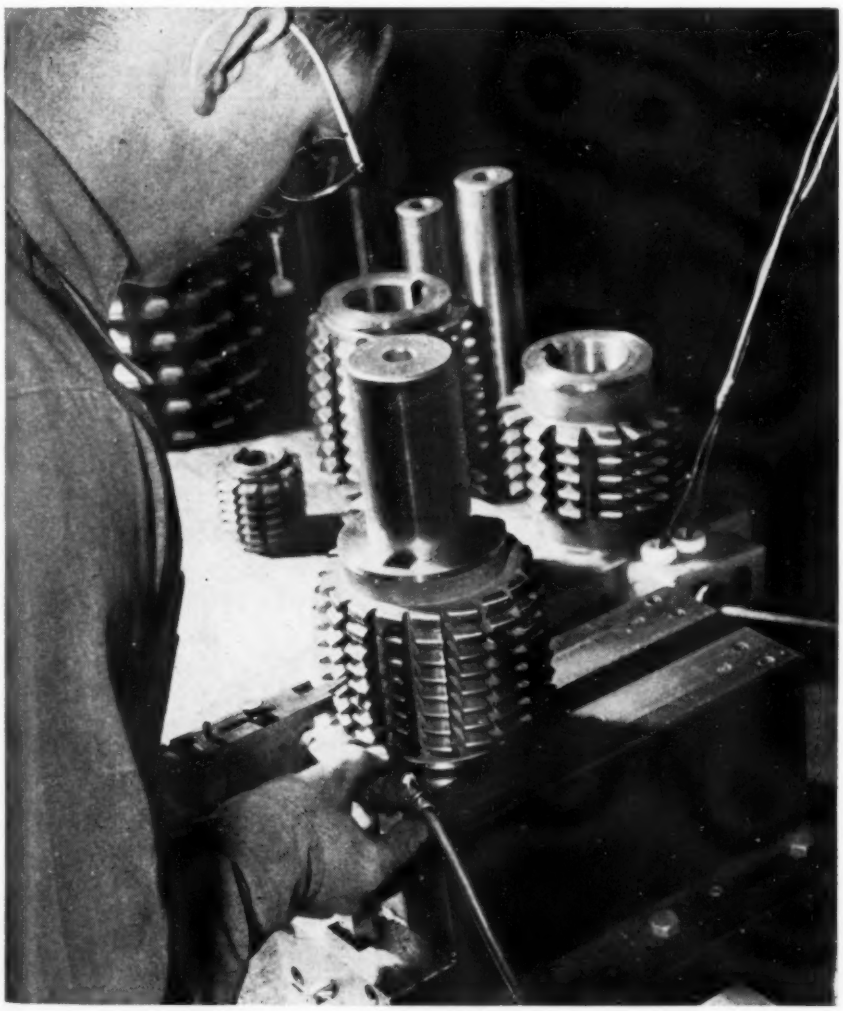
as follows: Pressure angle is maintained within 0.0002 in. Lead variation, tooth to tooth is 0.0002 in. Lead variation in one turn is 0.0003 in. Lead variation over three turns in the working section is 0.0005 in. Symmetry of approach where straight section of hob tooth curves off to tip or root is 0.0005 in. Spacing of flutes is 0.0015 in. Accumulated error in spacing of flutes is 0.0035 in. Flutes are ground radial within 0.0005 in. Allowable run-out of hub faces and diameters is 0.0002 in. For larger hobs slightly larger tolerances, depending on size, are permitted.

All hobs are Magnaflux checked for hardening and grinding cracks, after which the lapped bore is measured and all general dimensions, other than the teeth, are checked. After the tooth thickness is checked with standard verniers, the hob is mounted on an arbor, placed in V-blocks on a surface plate, and the cutting face of finishing hobs is checked to determine how close it is to being ground radial. This is important, because a finishing hob ground other than radial will produce an improper pressure angle.

The hob is also checked for flute-spacing errors from "flute to flute," and for one revolution of the hob. It is necessary that these flute-spacing or sharpening errors be watched closely and corrected if necessary, as they will cause distorted profiles. In some cases



The cutting face of finishing hobs is checked in this set-up to determine how close it is to being ground radial. When the cutting face is not radial, an improper pressure angle will be produced



The grinder operator checks finishing hobs for radial grind, and roughing hobs for rake angle. This is a practical shop procedure. Since it is a critical one, a light gage is used

they will produce the same results as hob run-out.

The hob is then placed in a universal type hob-checking machine where all remaining checks are taken. The outside diameter of hob teeth, faces of hubs and hub-datum diameters are indicated next. The hub-datum diameters will be used each time a hob is sharpened, checked, or used on a hobbing machine; they are very important.

The next step is to check the gash angle, since it will affect the lead check if not correct.

The tooth form of the hob is one of the very important factors in producing ing an accurate pressure angle and symmetrical tooth. While the hob is in the universal measuring machine, the tooth form is checked on each side for variation in the straight portion, and also to determine whether the left and right sides of the hob teeth are symmetrical within the desired limits. The approach and symmetry of approach are also noted and recorded.

The universal hob-measuring machine is next used to check the lead of the hob over the cutting edges, as the lead variation, tooth-to-tooth, for one turn and for three turns in the working section of the hob, must meet specified tolerances.

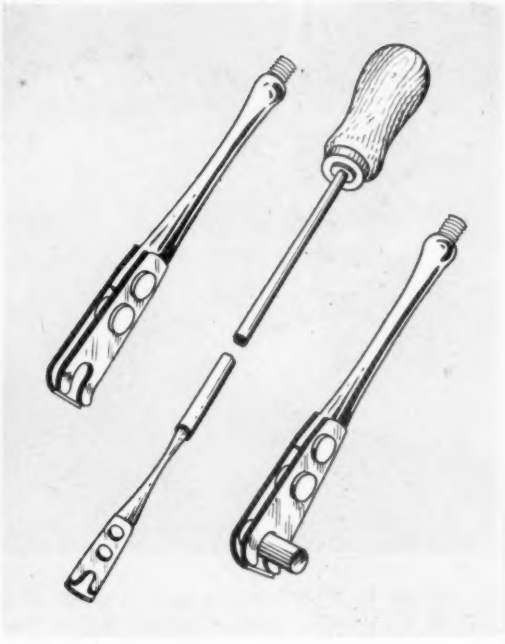
Hob Sharpening

It is easy to understand that systematic control must be exercised over these hobs as they are sharpened. With this in mind, it is recommended practice to locate the hob and cutter-sharpening department adjacent to a centralized inspection and standardizing department.

Used hobs turned in to the grinding department in the General Electric plant at Lynn, Mass., are carefully examined by the supervisor, who determines the amount of grinding and sharpening necessary. A card record of the serial-numbered hob is made, showing the date, condition of the tool, and amount of stock ground off.

After sharpening the grinder operator checks his finishing hobs for radial grind and his roughing hobs for rake angle. This is a practical shop check, and is very critical, since light is used in this test.

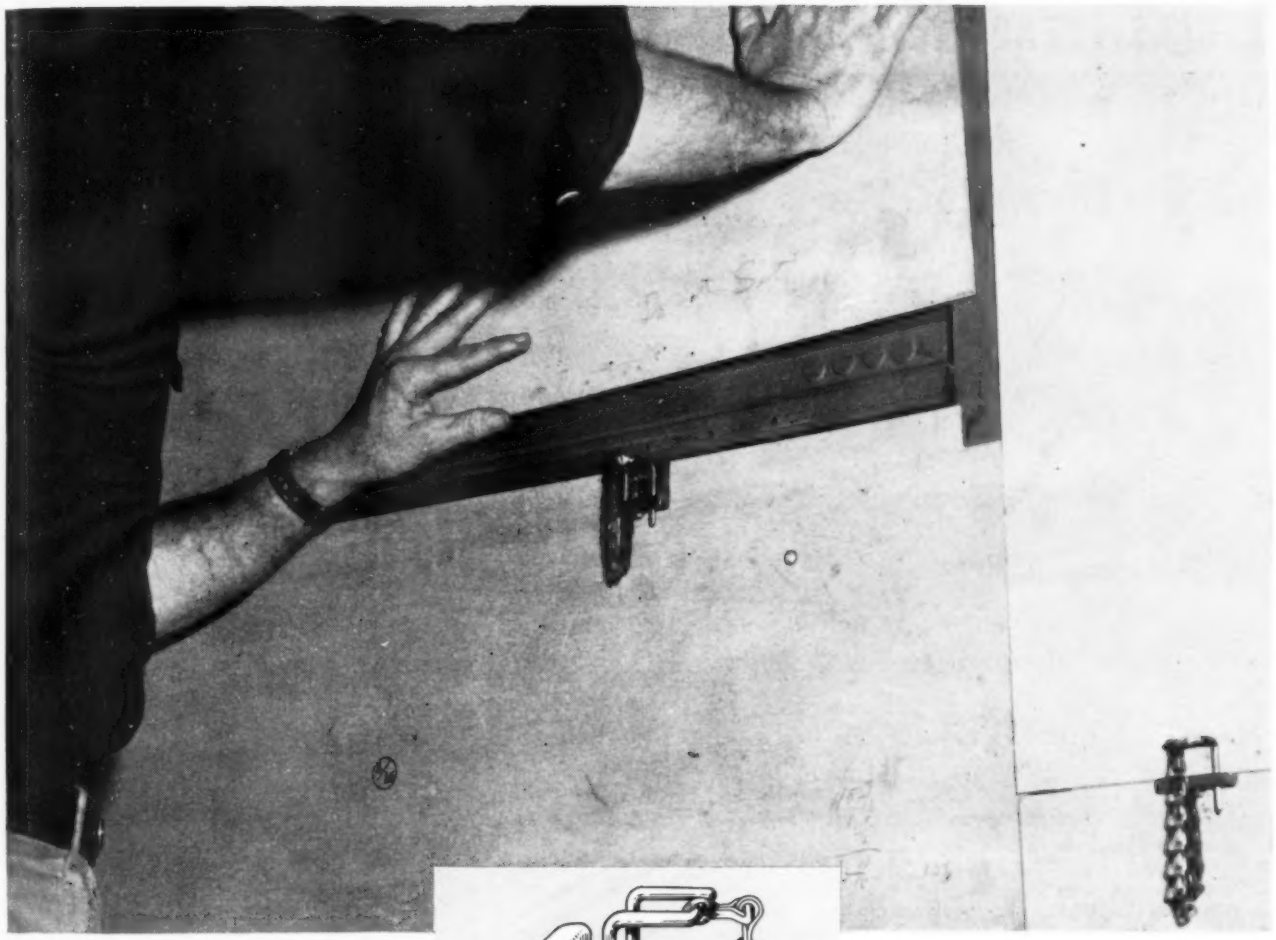
Resharpened hobs are then sent to the central inspection department for final approval, where the radial grind, flute spacing, and flute angle are checked. After this final approval, the hobs are placed in their individual protective bins and are ready for service again. When set up properly by experienced operators on precision equipment, these hobs can be depended upon to cut gear teeth within the required tolerance.



Rivets must frequently be set in inaccessible places when making aircraft assemblies and subassemblies. Here is a tool with a standard screwdriver handle and various lengths of extensions that simplify the job. It consists of a short piece of ¼-in. rod threaded on one end and flattened and slotted on the other. The flattened end has a short strip of spring bronze riveted to each side of it, one of which is slotted for half its length. The spring action of the slotted strip holds a rivet securely enough for maneuvering into desired location, saving valuable minutes.

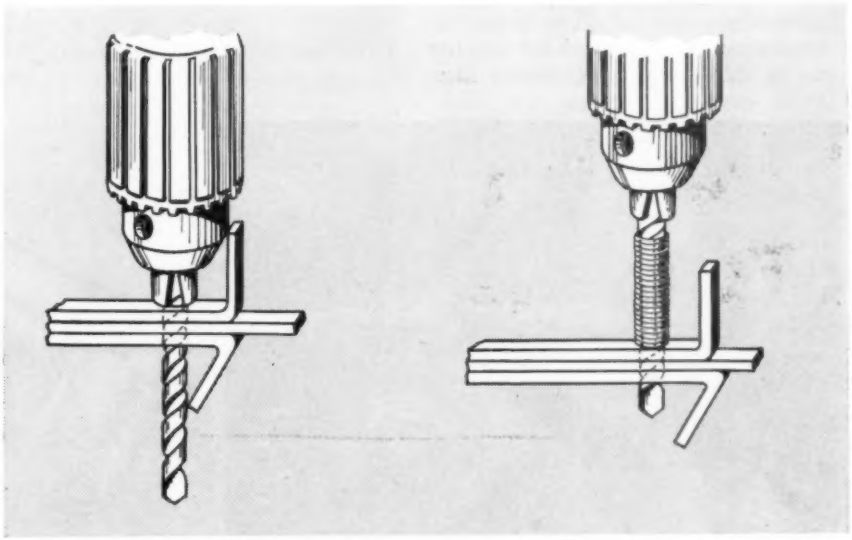
Little Ideas That Pay Big Dividends

Temporary sleeves to identify electrical harnesses will save considerable production time when assembling the harnesses in airplanes. The sleeves are slipped on during assembly and are removed after wires are trimmed to proper length at which time a permanent identification number is attached to the wire. The sleeves are made of short pieces of insulation tubing properly numbered and are hung on pegs in front of the operator arranged in the same pattern as the plug wiring diagram. The sleeves can be used for an indefinite length of time.



Overlapping sheets of metal in an upright position are usually located and held by clamps, often requiring considerable time to locate them properly. This holder, which simply hooks over one sheet to locate the second sheet accurately and quickly is easily detached by removing guide pin. It can be made from scrap sheet steel and cold-rolled stock in a very short time.

WHO IS better able than the workman on a job to suggest ways and means to increase his production? Given the opportunity and encouragement, men at machines and on assembly lines will design and make tools, jigs, fixtures and appliances that not only speed their work, but also remove safety hazards. Consolidated Aircraft Corporation through its Employee Suggestion Committee has promoted this activity. Here are a few suggestions resulting from it.



Drill stops made from spring wire can be used to replace tubing and other types of stops where rivet holes are being drilled. The advantage over tubing lies in the fact that this stop will not flange out and mar surfaces beyond the area to be covered by the rivet head. The stop is made of steel wire wound counterclockwise. Therefore, it will tighten while in use and will not drop off.

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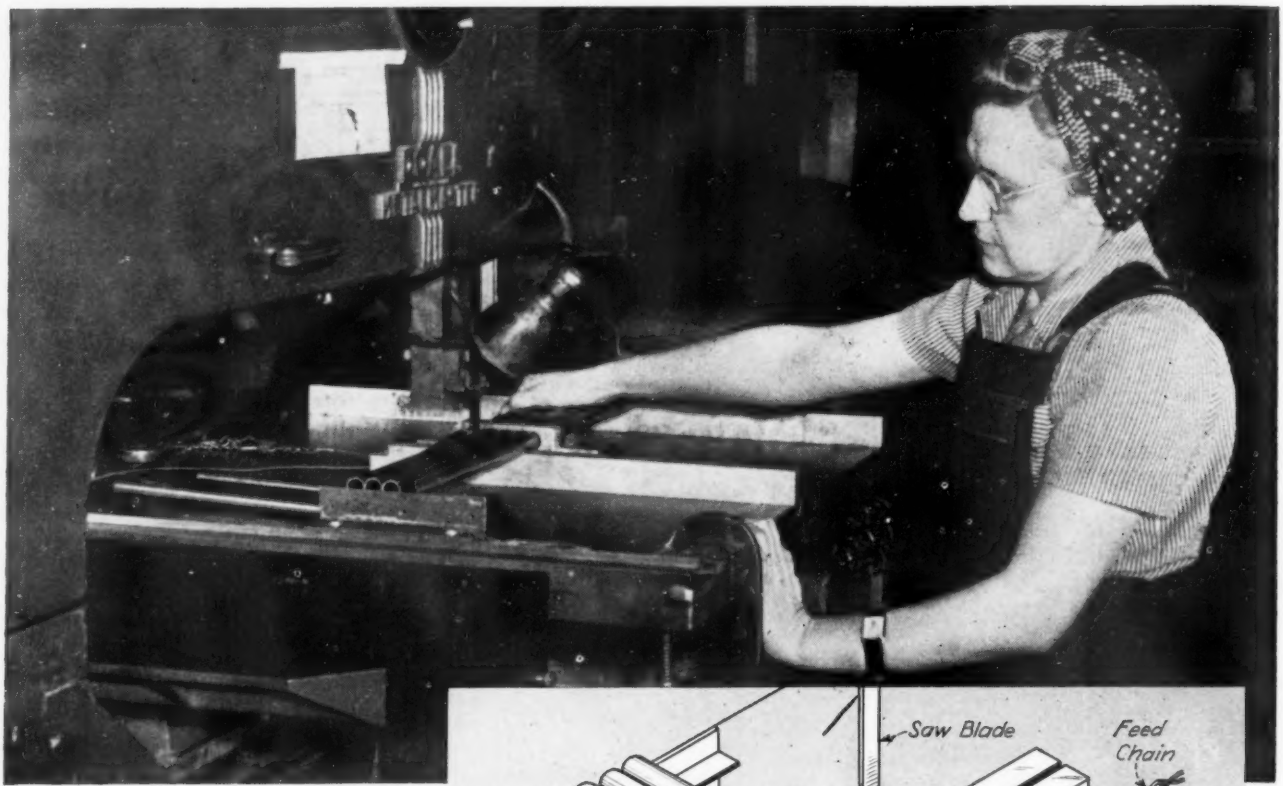
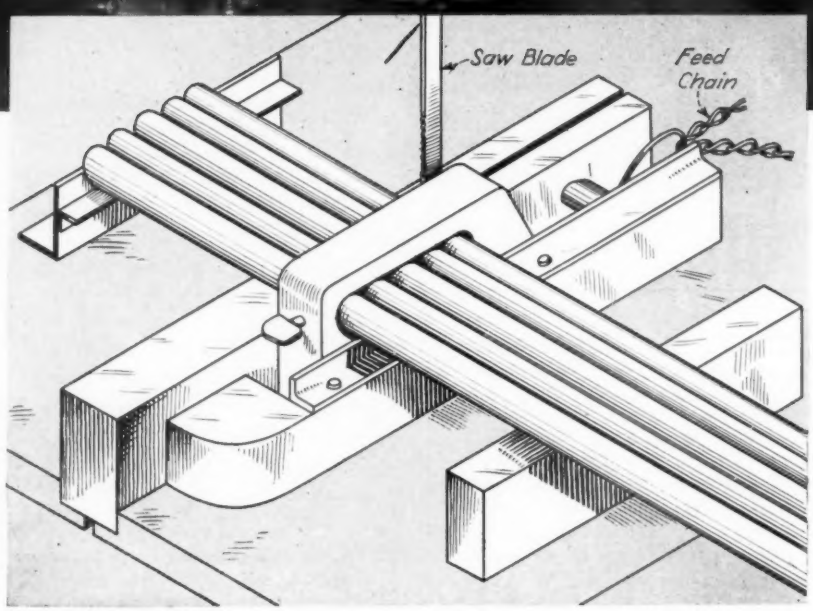
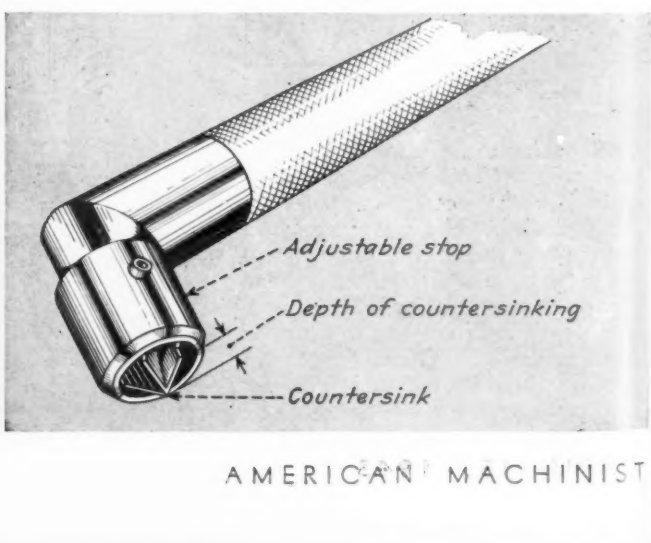
LITTLE IDEAS THAT PAY BIG DIVIDENDS (CONTINUED)





Clamping fixtures previously used by Consolidated held only one piece of steel tubing during a bandsaw cutting operation. The fixture now used holds five tubes. The tubes are supported on fixed parallels. They are passed through an intermediate work holder that is pulled by a chain connected to the machine feed.

Countersink stops for right-angle drills are being used by Consolidated. Once set, the stop will prevent the countersink from drilling beyond a depth equal to the distance between the end of the tool and the ground face.



What Will Become of Surplus Tools?

After the War—What?

A suggestion for disposing of surplus machine tools after the war, by J. R. Porter, chairman, Marshall & Huschart Machinery Company, has inspired considerable discussion.

Mr. Porter suggested that government agencies dispose of tools to the original manufacturer, after which the latter could arrange resale for industrial use through regular channels. None, according to his plan, would be sold by the government to speculators. Where there exists an agreement that the government agency shall sell to the war contractor, the sale shall be handled by the machine tool builder whose products are involved. In disposing of a machine to a tool builder, the government shall not exact payment until it has been resold. Prices for resale by builders should be established on the basis of "As Is" or "To be reconditioned by the manufacturer and carry the original guarantee as to accuracy, etc."

Would Create Body to Control "De-Tooling"

By D. N. MACCONEL, president, Machinery Sales Company

The greatest cost reducer of almost any article we come in contact with in our daily life is the modern machine tool which has enabled us to pay our labor the highest wages in the world. Obviously we must have a wide awake and progressive machine tool industry if the United States is to maintain its world leadership in high wages and a high living standard, and is to be in a position to compete for world markets.

The basis of a start to the solution is to maintain an organization similar to the present tools section of the War Production Board. This should function for a period of three years after the war is over and be operated by personnel from and paid for by the machine tool industry itself, and include government employees. It is hoped that the three-year period will be short enough so as not to destroy freedom of enterprise and yet long enough to enable the industry to exercise healthy initiative and proceed with further development without being continually harassed by the surplus of used but "nearly new" machine tools.

The tools section would have as its duties to:

1. In cooperation with the Army and Navy, establish a permanent munitions industry.
2. Select certain factories as reserve capacity and maintain them in good condition and quickly available for operation.
3. Ship surplus government-owned tools, under a continuation of a form of lend lease, to United Nations for use in rebuilding of services and utilities and for training in vocational schools, and for other non-competitive projects.
4. Junk all tools over ten years of age, thereby making this nation richer in productive capacity.
5. Supervise the orderly disposition of independently owned surplus machine tools.

We will have a problem that neither the industry nor the government can solve alone. Furthermore, it is only part of a problem of tremendous magnitude. If the machine tool industry is to expect relief from what promises to be a very distressing situation, then it must also expect to contribute in the way of taxes and manpower to operate a well thought out plan.

Advocates Disposal Abroad

By GEORGE HABICHT, JR., President and General Manager, Marshall & Huschart Machinery Company

After the war is over we are going to have to remain a military nation for some years to come to enforce whatever peace is established. Practically all of the large government plants built and equipped to produce Army material should be maintained intact by the government until such time as we are definitely assured that a continuing peace has been attained.

The balance of the equipment should be held by the government agencies owning it, at least during a stabilization period after the war. Machinery for its disposal should be set up so that all of this equipment could be sold outside of the domestic market to rehabilitate the countries of our Allies. Even if we had to give it to those countries, we would be much better off than throwing it on our scondhand market as was done after the last war.

This emergency has certainly demonstrated the value of the machine tool industry to the welfare of our country, and even if the government had to subsidize the industry, I believe in the long run it would be well worth while.

To Re-Tool College Shops

By C. E. BULLINGER, Head of Department of Industrial Engineering, Pennsylvania State College

I suggest that the engineering colleges of the country be given an opportunity to obtain such machine tools as they can use. Many of their machine tools date back before the last world war. We believe that these tools are outdated and should be replaced by

new ones. College budgets for new equipment are generally low.

Equipment which could be used by college shops would vary with the institution. In general, they would consist of a larger number of general purpose machine tools, together with one each of the various special purpose machines.

Aid to New Shops Would Insure Democracy

By GLEN ROBERTS, Northwest Automatic Products Corporation

Small manufacturers and new firms entering business should be encouraged in the purchase of these tools, even if it is necessary for the government to guarantee their credit. Many good engineers and mechanics will have made a stake and will be anxious to enter business for themselves. These people should have all the encouragement possible in bringing out new ideas and new products to put on the market. This is the finest kind of spending, whether by government or by individual, as the machine tool will replace itself by depreciation in approximately ten years and in this respect the money has not been spent, but merely invested and re-invested.

With the thousands of engineers and mechanics who will have a financial start from war savings, these machines will start new businesses, a new product, and put people to work so that it will not be necessary for the government, labor leaders, and big business to get their heads together to keep the public working. This program would be our greatest protection to maintain America as we have known it in the past.

We are approaching the time when Mr. John Public will have to choose between a total government and private industry. A program of the kind outlined can create keen, clean competition and give us the right to get ahead according to individual ability and initiative and reduce the chances for a dictator type of government.

Against "As Is" Sales

By S. W. CORBIN

In my opinion, the procedure of reselling machine tools by the builders might well be established only on the basis of "To be reconditioned by the manufacturer," or, better still, "To be reconditioned and modernized by the manufacturer." No "As is" prices would be established and no "As is" sales permitted.

On this basis the machine tool industry could immediately gain consideration from the government for the contributions which it and it alone could make to the success of the procedure and would establish itself in a more favorable light than that of acting as a mere agent or broker for government-owned machines. Because the manufacturer would be making a direct contribution in rebuilding or modernizing the machines, the plan would carry no stigma of a direct subsidy to a favored industry with all the political repercussions which that charge might imply. "As is" sales may be argued against on the grounds that there are no industrial machines where the manufacturer's original quality is more essential.

The machine tool builders would have an opportunity to rebuild their products to the original standards and to exceed these wherever proper. Manufacturers, who at the behest of the government built "war babies" of which they are not particularly proud, could bring these up to their normal peacetime standards. Machine tools could be strengthened and otherwise prepared for the higher cutting speeds and greater cutting rates which the new tool materials will permit. The manufacturer might well install the new electrical drives and controls which will be available and which in themselves may often be the chief distinction between an obsolete and an up-to-date machine after the war.

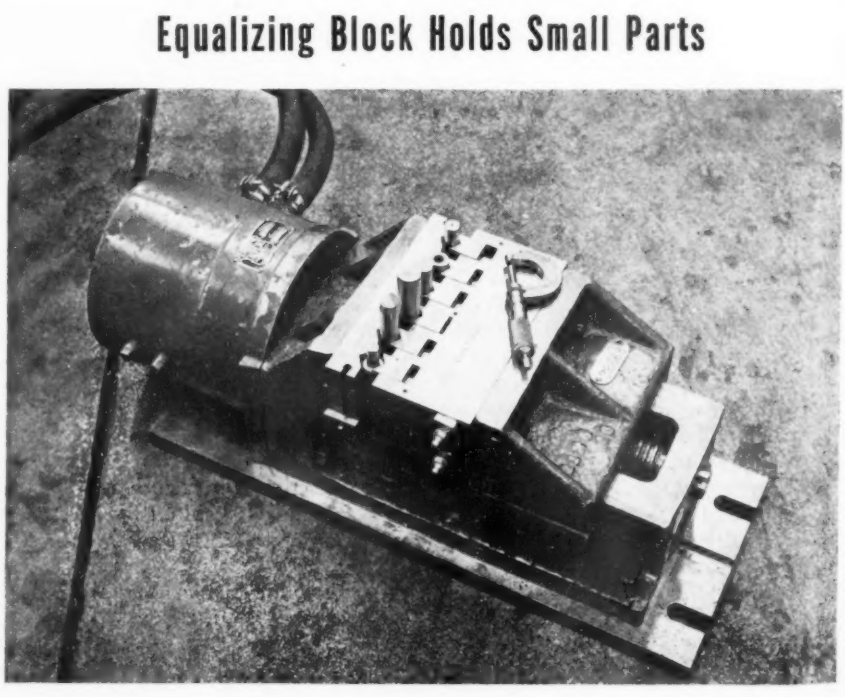
Would Aid Education With Modern Equipment

By G. B. MURDIE, manager, G. B. Murdie, Ltd., Victoria, Canada

Fine craftsmanship may suffer and gradually disappear if a program of technical education is not embarked on after the war. At the present time in large centers, no doubt, technical schools have a fair amount of machine tools, but most of those have been of the smaller and bench variety, and while they have the same essential parts, the feel is not the same as for a large machine.

I make a plea to equip every technical school on the continent with an adequate number of machine tools with the sole proviso that they be not used on commercial work by evening classes. I suggest that the technical schools be given the newest and most up-to-date equipment that we have, that the younger generation may get acquainted with modern machine tools.

Equalizing Block Holds Small Parts



Small parts are gang milled by chucking them in an equalized block held between the jaws of a pneumatic vise. Regardless of variations in the size of the work, the clamping pressure on all parts is equal. Oil sealed in the block is manifolded to plungers back of the V-jaws. In the setup shown, upper and lower sets of jaws are provided, each with its own oil chamber, to insure a double grip on long parts. Test pieces are used to demonstrate that the block will function on widely varying diameters. Vega Aircraft Corporation.

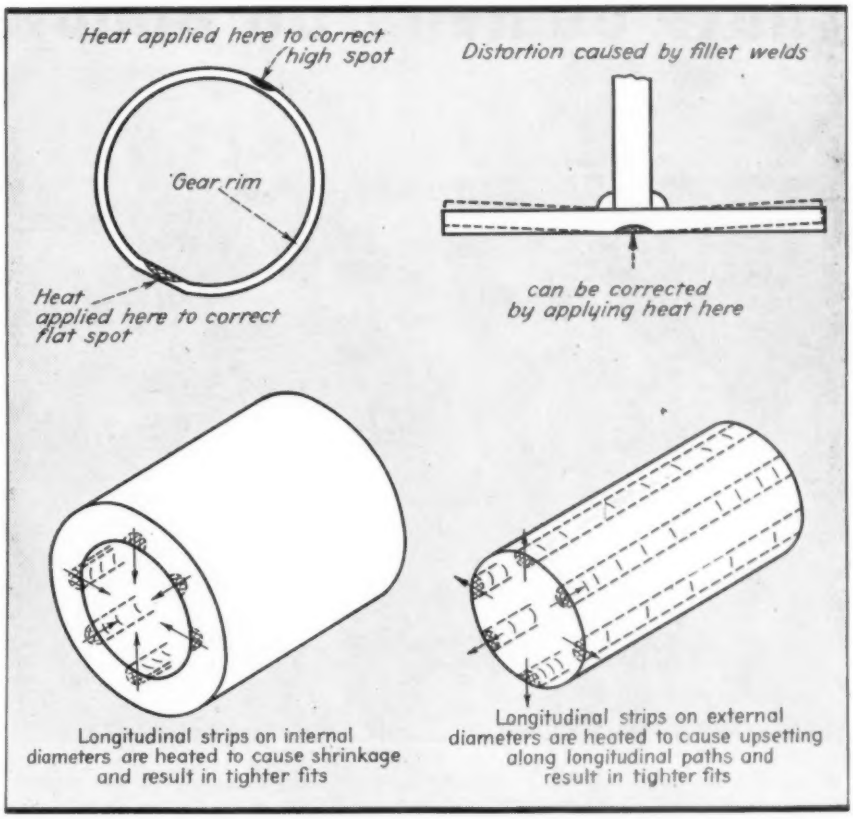
Warpage Corrected by Flame

BY C. W. HALE, AIR REDUCTION COMPANY

The oxy-acetylene torch can be used to correct high and low spots in steel bands, tighten fits on cylindrical pieces and to straighten warped weldments

FLAME STRAIGHTENING and warp control with an oxyacetylene torch depends on the principle of permanent contraction or "forging up" of metal to which heat has been applied. Specifically, when the flame is applied to a small area or section, the metal attempts to expand, but since this is prevented by the cold surrounding material, the metal in this zone is locally upset when the heated section is cooled or quenched. The contraction thus effected is permanent and serves to remove warps, bends or bulges in structural shapes, castings or plate.

In practice, the heating flame is applied to the surface of the metal, working an area or strip about 1-in. wide and constantly moving the flame with a zig-zag motion. The surface should never be heated above a cherry red, and usually to a depth of about $\frac{3}{16}$-in., so that no oxidation or internal fractures result. The main object is to apply the maximum amount of heat in the shortest possible time to secure a powerful local expansion in the surface of the metal. The process is not recommended for steel above 0.25 carbon content, nor should steel above 0.15 carbon be immediately quenched with water. Quenching accelerates but does not increase the total effect.


Heat applied here to correct high spot
Distortion caused by fillet welds
Gear rim
Heat applied here to correct flat spot
can be corrected by applying heat here
Longitudinal strips on internal diameters are heated to cause shrinkage and result in tighter fits
Longitudinal strips on external diameters are heated to cause upsetting along longitudinal paths and result in tighter fits

High and flat spots on steel bands or gear rims, as well as distortion caused by fillet welds in T-shaped assemblies can be corrected with the oxyacetylene flame. Tighter fits on cylindrical pieces can be effected by heating along longitudinal paths

Welding Distortion Eliminated

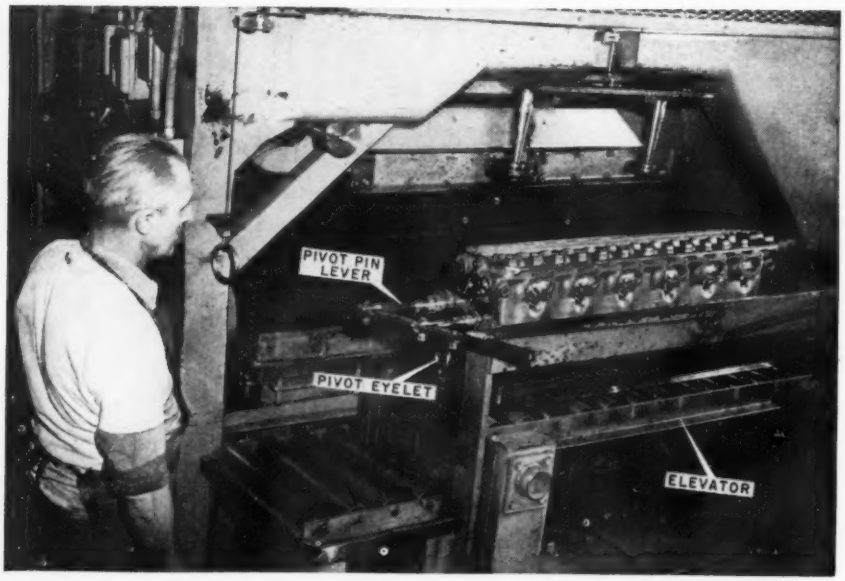
The process can be used with good results on I-beams, angles, channels or plates to eliminate distortion caused by gas or electric welding. Conversely, it may be used to introduce bends in hull plates, turrets, stacks or other shipyard products. Sections which have been incorrectly shaped may be brought into proper alignment or have bulges removed without being removed from the assembly and without the use of any hammering. It is possible to bring a flat plate into a perfectly cylindrical form with this process. Since heavy sections respond best, thick slabs or plates from the mills may be brought flat enough for planing or machining without furnace reheating or pressing. Deseaming equipment can be used in such cases.

Also, it is possible to straighten bent shafts or to shrink the interior diameter of sleeves or collars. Fits on outside diameters may be tightened by local upsetting along longitudinal paths. Thus, many errors in turning, machining or boring may be corrected. Fits of worn parts may be tightened, and many bent shafts or shanks may be straightened. Proper application of heat will yield corrections within close tolerances without harming the metal.

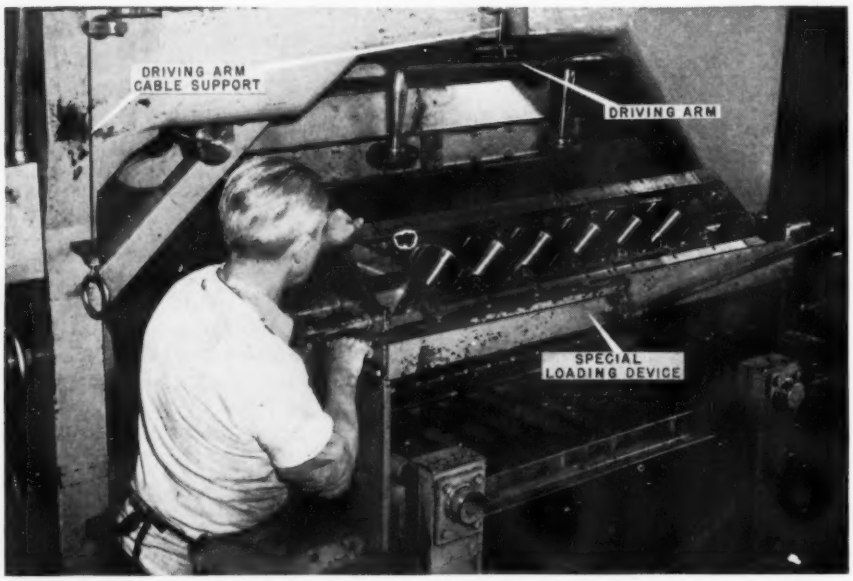
Castings also respond well to the process. In crusher jaws, for example, by applying the heat to the ribs or webbing at the back it is possible to introduce a reverse distortion so that the face will be flat after the normal amount of warpage which always takes place when the teeth have been rebuilt.

The process has been found especially useful in fabricating shops where much of the work is assembled by welding. In fabricated gears, for instance, difficulty is often experienced with the band or rim in which the teeth are cut being out of round after it is welded to the disk. These high spots may be removed before the teeth are cut, and the gear carburized, by the proper application of heat to the rim. In these shops warpage is usually encountered when fillet welds are made on each side of a member, forming a T-shaped assembly. By the application of the flame to the center of the section, forming the top of the T, the ends easily may be brought flat without the use of any force.

Machine Lapping That "Couldn't Be Done"



When the conveyor elevator lifts the cylinder-bank assembly to the proper level, pivot pins in the loader can be engaged with the pivot eyelets in the work pallet to support the piece when the elevator descends



As the conveyor elevator descends, the operator rolls over the assembly, pushes the loader toward the lapping machine, drops the machine's driving arm so that fiber disks enter cylinder bores

LABOR SELDOM CHEERS the substitution of a machine process for hand work, but the Allison Division of General Motors recently had a case that was accepted enthusiastically. To obtain a satisfactory seal at the joint face of the cylinder-block assembly (one bank of cylinders) it is necessary to lap within 0.0002-0.0003 in. Because machines were not available for dragging the 340-lb. assembly back and forth on a lapping plate, labor grievances were common. It was difficult to find men (three to four were needed) who would stay on this hard and monotonous job for any length of time.

From a production standpoint, the hand lapping method was unsatisfactory in several other respects. Because of non-uniform lapping pattern and pressure, the lapping plate wore unevenly, thereby requiring continual checking and leveling. After processing about 1,500 blocks, the plate was so worn that it could not be leveled to the required tolerance, and remachining was necessary.

Special machine builders and consulting engineers were called upon to determine the feasibility of designing an automatic lapping machine. Consensus of opinion was that the cost of experiments alone would reach $50,000-$100,000, and that the idea was probably impractical.

Despite these discouragements, an automatic precision lapping machine and two pieces of auxiliary equipment —an elevator to lift the block from the conveyor to lapping-plate level, and a loader to transfer the block to the lapping machine—were built for approximately $5,000. With this equipment a single operator merely manipulates controls. Man-hours connected with lapping have been reduced 89 percent as compared with the former hand method, because two men have been transferred to other duties, and the machine operator spends part of his time on nearby parts-washing operations. Labor grievances on the lapping operation have disappeared and, if this were the only improvement, the installation would be worth while in these days of manpower shortages.

The war effort is promoted in other directions by this development. An increase in production of 69 percent has been realized. Better quality of the joint seal is secured because the lapping action is entirely automatic. Maintenance labor is conserved since it is necessary to check the machine only once daily, and to level the plate at intervals often of several weeks. With hand lapping, from three to four hours were consumed each day in checking and leveling.

In comparison with hand lapping,

Labor balked at the drudgery of hand lapping the heavy Allison cylinder-bank assembly; some engineers said an automatic process was impractical. But the machine repair department designed and built easily operated equipment that reduced labor 89 percent, increased production 69 percent

the exact pattern of work movement in the machine process achieves uniform wear of the lapping plate, thereby conserving lapping-plate material. Hand lapping plates were serrated 0.062 in. deep to form ½ in. square blocks. After producing 1,500 pieces, these plates were resurfaced by removing 0.075 in. of material and again serrating. When the plate was reduced from the original thickness of 1 in. to ⅝ in., it was scrapped. But the lapping plates used on the machine give between 4,500 to 5,000 blocks per surfacing, and they are serrated only 0.040 in. deep. Therefore, it is necessary to remove only 0.055 in. when resurfacing, as compared with 0.075 in. for the hand lapping plate.

There is less chance of work damage as the result of carelessness or accidents, since the number of handling operations involved in the machine lapping method is sharply cut. The installation has saved seven electric-crane pick-ups, which are potential opportunities for making scrap out of a costly assembly.

Altogether, the improvements realized since installation of the automatic lapping machine have resulted in substantial dollars-and-cents savings.

These results are obtained with the three mentioned pieces of equipment, which have been designed to minimize effort and the chance of work damage. The sequence of operations follows.

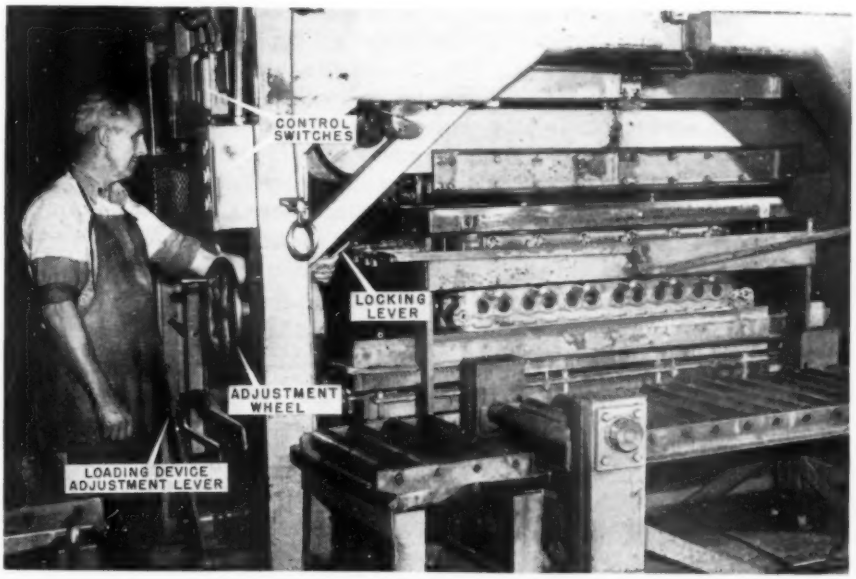
How the Lapping Machine Works

The cylinder block assembly leaves a washing machine upon a special pallet equipped with a pivot eyelet at each end. The block is pulled by hand along the roller conveyor until in position upon a conveyor elevator in front of the lapping machine. By means of push-button control, the operator causes the block to be lifted to a level a fraction of an inch above the lapping plate, ready for transfer to the machine loading device. With his right hand, the operator throws a lever that causes pivot pins to engage the pivot eyelets, and after the conveyor elevator descends he rolls the block over with his left hand.

His next move is to slide the automatic loading device toward the lapping machine. With his left hand, the operator releases the cable holding the driving arm and with his right he guides the driving arm down in the cylinders. The driving-arm has two long pins fitted with fiber disks that bear against the cylinder walls near the bottom to prevent cocking.

A lever that locks the driving arm is pushed. To set the block on the lapping plate, the operator manipulates a height adjustment, thereby taking the weight of the block off the pivot pins so that they can be retracted. Thereupon, the loading device is returned to the original position above the conveyor elevator.

By pushing another control button, the automatic lapping cycle is started. The block is caused to follow the lapping pattern illustrated for the established number of cycles, after which an electrical device automatically stops the block at the position it was placed originally on the lapping plate, to permit removal with the loader.



With the driving arm locked, the cylinder assembly is lowered onto the lapping plate to permit retraction of the pivot pins and removal of the loader

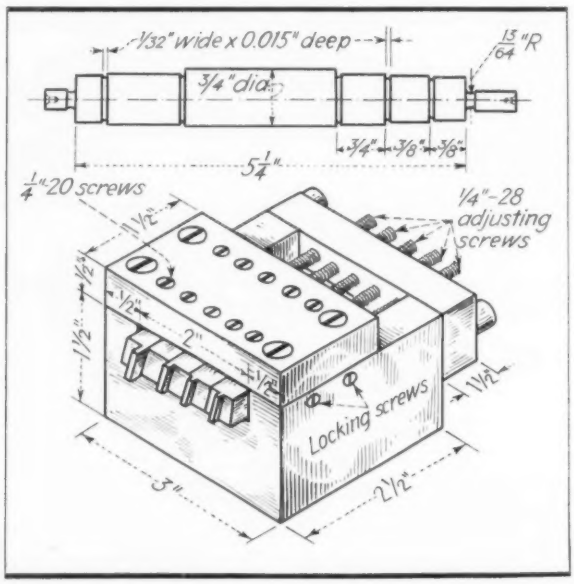
Uneven wear of the lapping plate is minimized by the uniform pattern of work movement established for the automatic cycle. As compared with hand lapping, three times as many blocks are produced for each resurfacing of the plate

IDEAS FROM PRACTICAL MEN

Multiple Toolholder for Bench Lathes

BY WALTER KARPUSIEWICZ

In order to speed the machining of shafts shown in the drawing, the illustrated toolholder was built. It holds five $\frac{3}{8}$x$\frac{3}{8}$-in. tool bits for grooving the recesses between the different diameters on the shaft. The holder was mounted on the carriage of a South Bend bench lathe, which was run in reverse to minimize chatter attendant with this particular set-up, as well as to leave enough room for fastening the toolholder to the compound rest. The toolbits were of course inverted. This tool and set-up increased production 400 percent over the method used formerly.

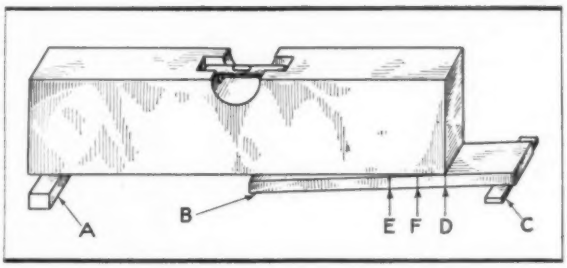


This multiple toolholder mounted on the compound rest of a bench lathe increased the production of recessed shafts 400 percent

How to Adjust a Level

BY H. NELSON

The following method for adjusting a level is fast and accurate. Place parallels *A*, *B* and *C* on a surface plate or smooth machine bed, making an incline of parallel *B* as shown by setting it on parallel *C*. Set the level on parallels *A* and *B* as shown, and move it sideways until it registers level. Mark the location of the end of the level stock as at *D*. Now turn the level end for end, and when the bubble centers itself, mark the location of the end of the level stock as at *E*. Bisect the distance *DE* and scribe line *F*. Move the end of the level stock so that it coincides with line *F*, and adjust the vial until the bubble centers itself. The level



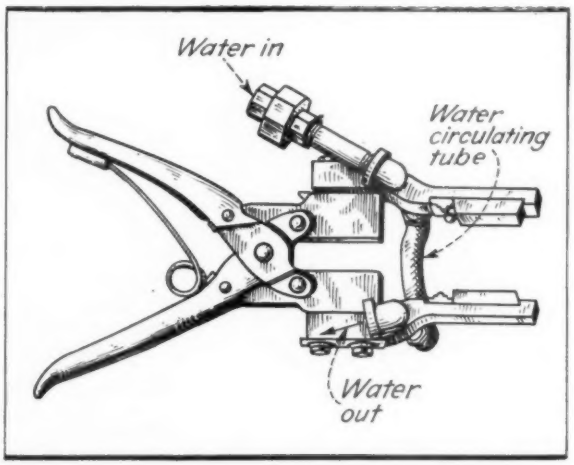
A level can be checked by mounting it on parallels, one of which is inclined. The center line on the inclined parallel locates it for adjusting the vial

can be checked by turning it end for end, registering the stock each time with line *F*. Making parallel *B* long and parallel *C* thin, a fine degree of refinement, within the accuracy of the level stock, can be obtained.

Water-Cooled Brazing Tongs

Silver soldering operations can be speeded with the aid of a pair of water-cooled tongs built up from a pair of 8-in. parallel flat-nose pliers. The tongs, used as carbon holders in the incandescent carbon process of silver brazing, are cool, light and efficient. They were designed and are now being used by a mechanic at General Electric's Schenectady works.

The tongs are easy to make. Steel blocks are first welded to the plier jaws to give them an outside width of $1\frac{1}{2}$ in. when closed. These blocks are drilled and tapped for $\frac{3}{8}$-in. studs. Bar copper is bent to fit the clearance required for the particular job to be handled, and the tips are cut to hold small blocks of carbon. The bars are drilled and tapped to accommodate



These water-cooled tongs, built up from flat-nose pliers, serve efficiently as carbon holders when silver soldering with the incandescent carbon arc

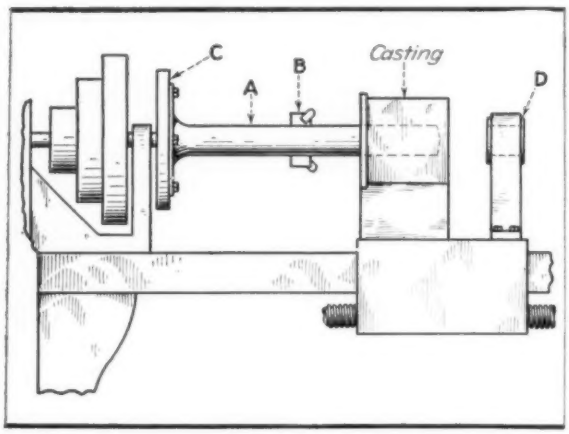
¼-in. pipe fittings by means of which water-cooled power leads are attached. A rubber jumper hose forms a water connection between the jaws; additional water carriers may be drilled the entire length of the bars if necessary. Mica sheets and bushings are used for insulation between parts and the pliers. A single-loop pronged spring of 0.091-in. wire, welded at one end and free at the other between the handles of the pliers, provides sufficient force to open the jaws when the braze is completed.

Lathe Adapted as a Boring Mill

BY O. E. HYLER

The application of Davis boring blocks to the running of large bores on any sturdy lathe is a simple matter of adapters. This is applicable to any casting with a cored hole.

The adaptation necessary for this operation consists of a flanged boring bar *A* slotted to take boring block *B*. Holes are drilled in flange *C* so the boring bar can be bolted to the faceplate. Bushing *D* takes the free end of the bar while cutting. This bushing is held in a U-shaped bracket bolted on both ends to the carriage



This set-up cuts production time when boring a number of castings. An outboard support bearing on the carriage eliminates the use of the tailstock center

so that when the work in front of the bushing is fed to the cutting tools, the bushing is also carried forward, thereby supporting the bar rigidly.

The length of bore which can be be run on this set-up is limited only by the distance the carriage can be run toward the tailstock. With the carriage in this position, it can be seen that the maximum length of bore is the distance between the end of the boring bar and the bushing. This, of course, will vary with the length of the lathe bed.

A variation of this adaptation is to swing a boring bar to both centers after placing it through the cored hole in the casting, and then driving it with a lathe dog. This is satisfactory for single pieces, but entails considerable work and time in changing pieces.

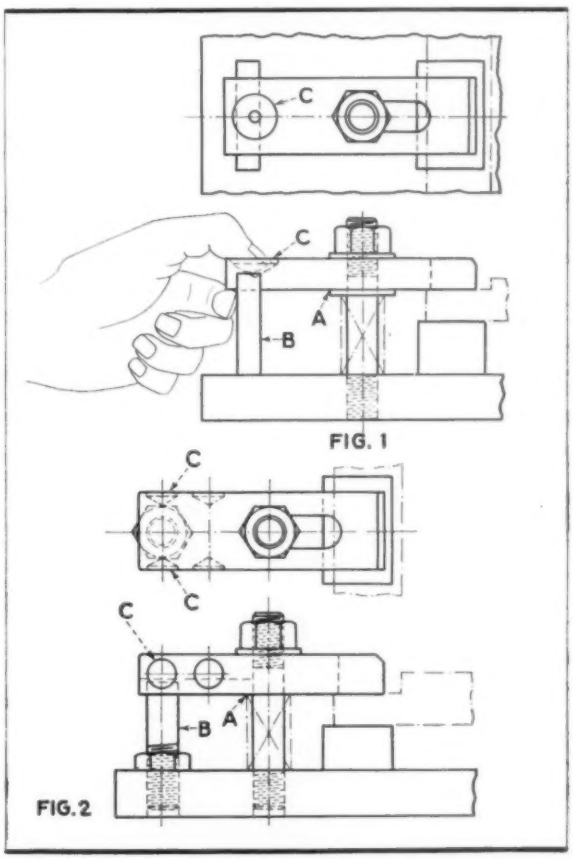
Eliminates Knobs for Handling Clamps

BY NELSON HALL

The production from jigs and fixtures can be increased greatly if the sequence of operations in locating, clamping and removing the work is completely thought out while these tools are being designed. Handles, hand knobs and nuts can then be arranged conveniently to facilitate loading the fixture or jig during its life.

Many times an "on-and-off" clamp may be fitted with a pin to pull the clamp back and forth. A pin more or less is in the way of the wrench and sooner or later becomes bent or broken. Often where there is a sliding clamp *A*, such as shown in Fig. 1, that rests in cradle *B*, a thumb hole *C* will give the operator a convenient grip. This hole can be made with the point of a drill and is never in the way, and yet it forms a good grip even when the clamp is wet with cutting fluid. Furthermore, the operator will not bump his fingers against cradle *B*, which frequently occurs when he reaches over the top of the clamp in the usual manner.

In Fig. 2 clamp *A* is riding on stud *B*. Holes *C* are spotted on the side for the thumb and fingers. The operator soon becomes acquainted with the location of



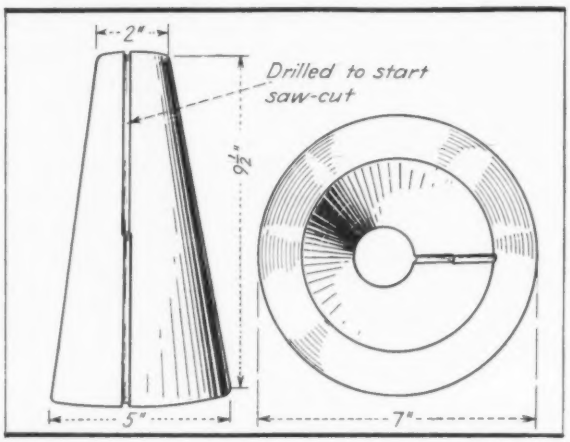
Knobs and pins for raising clamps on fixtures can often be eliminated in favor of holes spotted in the clamp. The holes prevent the operator's fingers from slipping

such spot. His hand automatically will go to them while manipulating a wrench with the other hand, thus coordinating the movements of the hands and speeding production without extra effort.

Cone Sawed From Bar Stock

BY H. J. CHAMBERLAND

The drawing shows a tapered slug 5 in. at the large end and 2 in. at the small end, which was sawed from a bar of S.A.E. 4140 steel 7 in. in diameter and 9½ in. long, leaving the shell shown at the right. The



Contour sawing removed this cone from a bar of S.A.E. 4140 steel, using a disk-cutting attachment

saw used was $\frac{3}{16}$ in. wide, 10 pitch, "A" temper and had a raker tooth set. A ¼-in. hole was drilled to start the saw cut. The hole was double ended with close alignment, even though it was drilled at a 9-deg. angle.

The job was done on a Do-All contour sawing machine. The female part was used as a drive fixture for thread milling a piston tube; the piece was, of course, subsequently precision finished by conventional methods. The sawing was done by using the standard disk-cutting attachment and a kerosene drip as a coolant. Sawing and machining required 12 hr.—saving of 6 hr. over the method used previously. However, this was secondary to the material saved in the form of a slug which otherwise would have reduced to chips.

Redesigned Gears Cut Production Costs

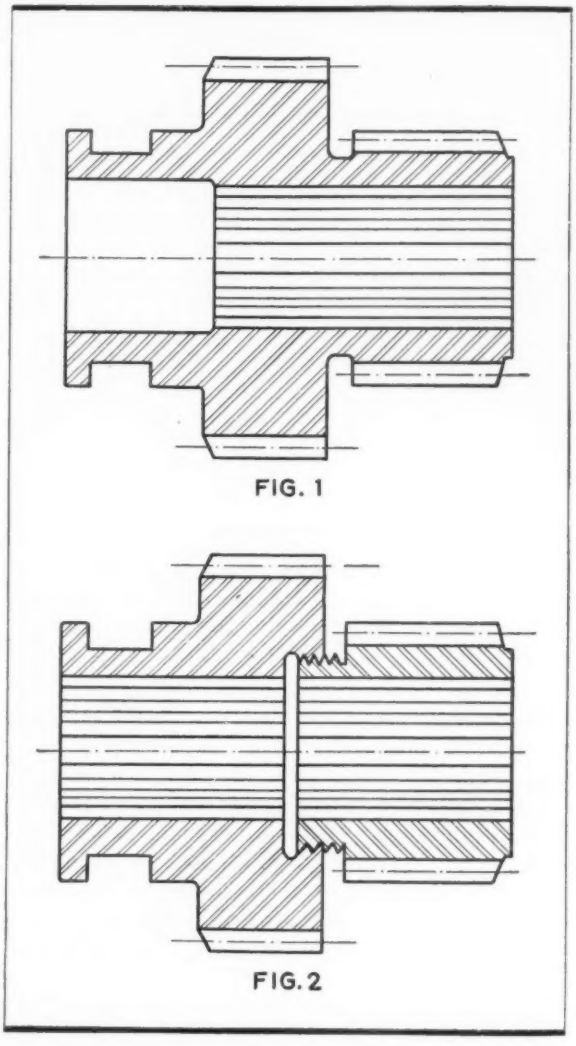
BY T. ADDISON

In the original design of a pair of cluster gears, the pinions were laid out for one-piece construction, allowing sufficient clearance for the shaping of the teeth. In detailing this design, as shown in Fig. 1, it was found that the length required would either necessitate a counterbored hole to facilitate broaching of the multiple spline bore, or a recessed hole with splines at each end of the bore.

Accuracy of alignment of these two sections of the broached hole was problematic; therefore, it was decided to produce this unit in two parts. Pressing one gear on the hub of the other did not solve the broaching problem, and would introduce the use of keys. Hence the final design adopted was threading loosely the two parts as shown in Fig. 2, with the outside diameters of the thread being slightly smaller than the root diameter of the smaller pinion.

This construction attains the following advantages:

1. Provides adjustment for spacing between gears.
2. Eliminates expensive broaching.
3. Reduces the cost of replacements, when and if necessary.
4. Either hobbed or shaped teeth with any desired pressure angle can be cut.
5. Use of keys is eliminated.
6. Provides both bearing and guiding at both ends of the unit, and facilitates sliding.
7. Decreases the pressure per square inch on both gear and shaft due to the increased length of bearing surfaces obtained.
8. Saves metal since the weight of the rough forging was reduced.



The cluster gears at the top were redesigned as shown at the bottom. This eliminated expensive machining operations and produced an efficient unit

How to Run a DRILLING MACHINE

This is number 2 in AMERICAN MACHINIST'S new series of training aids for war-crowded metal working shops. Designed to take the worker fresh from the streets and get him or her into production with the barest minimum of training, this section will tell him no more than what a drill press is, how it operates, what it can do. If the information in these pages can help you in your induction of new workers, reprints of the section are available from the Editor, AMERICAN MACHINIST, 330 West 42nd Street, New York, N. Y., at 10 cents a copy (less in lots of over 500).

The job of cutting round holes in metal is one of the most important in the machine shop because it is one of the commonest. Few pieces go through a metal-working plant without requiring drilling. Moreover, drilling is one of the first operations performed on a part. Later operations are frequently located from the first holes so accuracy at this stage is essential. Thus, the drill-press operator's responsibilities in producing machines to beat the Axis are great, and the necessity for careful workmanship on his part is a matter of first importance.

This then is your new job: a precise, efficient operation requiring skill and concentration if satisfactory workpieces are to be obtained and scrap avoided. If you have never been in a machine shop before, you may be somewhat timid about undertaking it. Everyone is at first. But you can get over this uneasiness quickly by actively studying the job. The better you know it, the surer you'll feel.

In many ways proper machine operation is a housekeeping problem. It is a matter of having the right tools in the right place, of keeping your work space and holding devices clean, of performing the details in proper order. It is important to keep chips out of the machine and the work to prevent damage to the machine and inaccuracy in the work.

Closely associated with cleanliness is safety. No machine tool is dangerous when used properly, but the power, speed, and materials used involve hazards that must be respected. Loose flowing hair or clothing can become entangled in spindles or tools, so wear head coverings and simple clothes. Keep your hands and arms free of jewelry which might catch in the machinery, costing you a finger or a hand. Work should be held firmly so that it is not torn loose by the force of the drill. All safety devices should be used. Intelligent understanding of your machine will both protect you and deliver the goods.

DRILLING MACHINES

In the machine shop the drilling machine takes several forms. The simplest of these is the sensitive drill press, a light, often high-speed, machine which is in common use for drilling small parts. It consists of a rotating spindle driven by a series of cone pulleys, a worktable which can be raised or lowered to fit the job, and a simple hand lever feed. The feed lever is geared directly to the quill in which the spindle turns so that the operator can feel how the drill is cutting, hence the name "sensitive drill." The drilling head can often be raised or lowered to accommodate jobs of different sizes.

The standard upright machine is a larger and heavier version of the sensitive drill. It is equipped with gears or pulleys to give a wider variety of speeds and a feed shaft and gearing to advance the drill into the work at a predetermined rate. It usually has more adjustments of the head and worktable to adapt it to operations on various types of work. Because the upright machine contains most of the elements found in drilling machines, it has been chosen for description in detail. The particular machine shown is an older type, but because it is simpler than the newer fully-inclosed types and has fewer control levers, it has been chosen to show how the upright works.

In the illustrated machine, power is applied to the spindle through four-step cone pulleys (18) and a pair of bevel gears (1). Between the upper pulley and the spindle drive gears are mounted the backgears (17) controlled by the backgear clutch lever (6). This lever has three positions: direct drive for ordinary drilling, backgear for slow heavy-duty work, and neutral to stop the spindle.

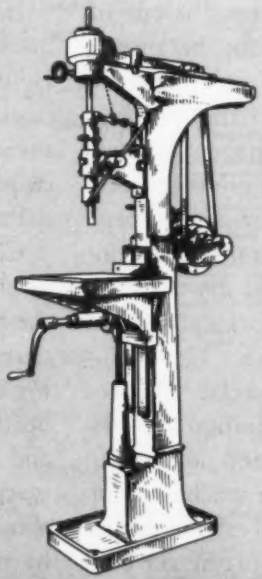
The spindle can be advanced into the work as in the sensitive machine by the use of the quick-return hand feed (21). This is used in production jobs which do not require positive control of speed and feed. The spindle can be moved slowly up and down by the handwheel feed (12) in lining up the work. Or, thirdly, the proper feed can be selected with the feed change control (19) and the power feed clutch (concealed by feed gear box) engaged to advance the spindle at the required rate.

The depth to which the drill should cut is controlled by the feed stop (8) which can be set to any depth within the travel of the quill (10). When the drill reaches the required depth, the stop prevents it from going farther. When power feed is used, the stop strikes a trip (9) when it reaches the set depth, automatically stopping the power feed.

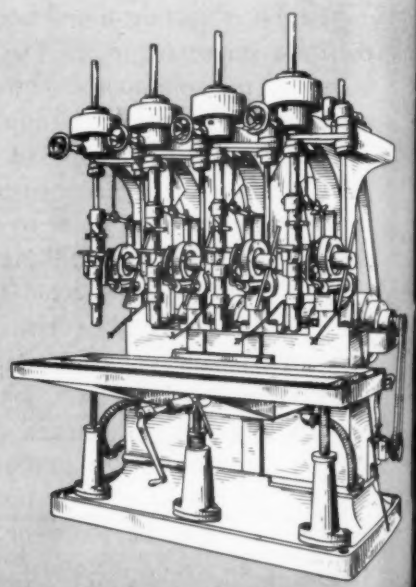
The entire drilling head can be moved up and down the slide (7) on the column and fastened in place by the slide clamp bolts (not shown). Though the table is usually set waist-high, it may be raised or lowered to accommodate awkward pieces by means of the elevating crank (24) and rack (23) or it may be swung out of the way when very large work is to be drilled.

To clamp the work, through slots are cut in the worktable for ordinary bolts and T-slots for T-bolts. The base, which forms a working surface for large pieces, also has T-slots cut in it.

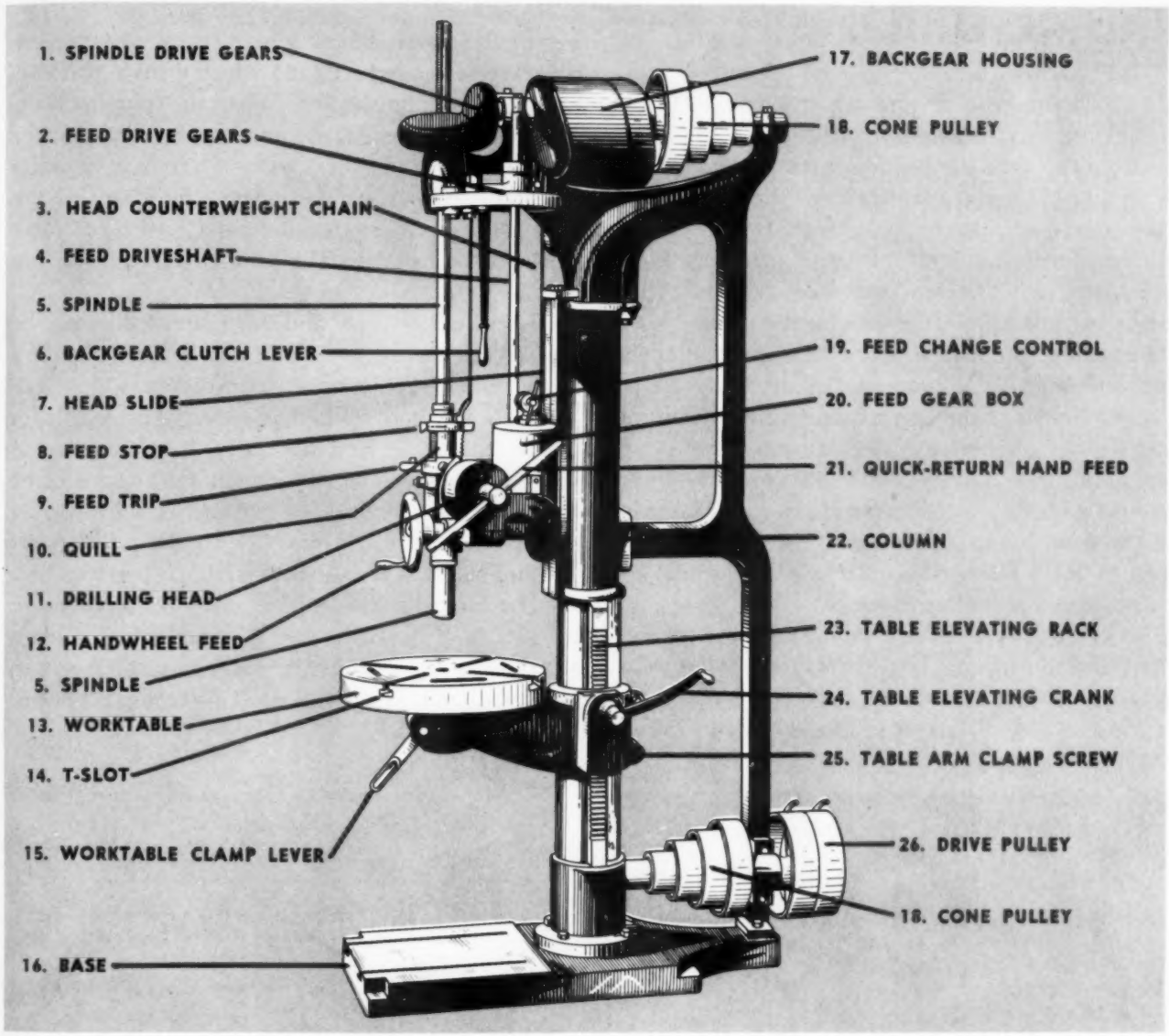
The drilling machine may take several forms. It may be light and simple like the sensitive drill, the basic style of which has changed little since it was first devised. Several sensitive drills or several uprights may be combined in a gang; or high production, multiple spindle machines holding many drills in a single head may be used. The radial drill, a valuable type for heavy work, is described on the following page.

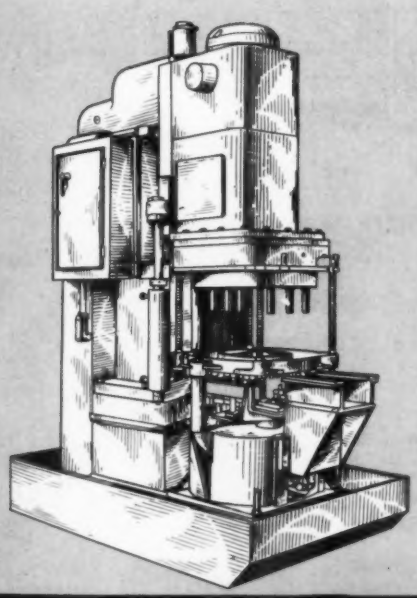


SENSITIVE DRILL



GANG DRILL





MULTIPLE SPINDLE DRILL

Sensitive and upright drill presses are frequently manufactured with more than one drilling head for a single worktable. Such drills are known as gang drills and are used when several operations must be performed on a single job. Thus, a drill, reamer, and tap might be mounted in adjacent spindles so that the work could move quickly from operation to operation.

High production machines are manufactured with a number of spindles in a single head. These are called multiple spindle machines. They are usually fully automatic and require only push-button operation once they are set up. The arrangement of the spindles can be varied to fit almost any shape within the area of the head. Over a score of spindles may be used in a single head, and in special machinery used by the automobile industry, combinations of two or more heads make it possible to drill over 100 holes at a time. Not many drill press operators will have to run these machines.

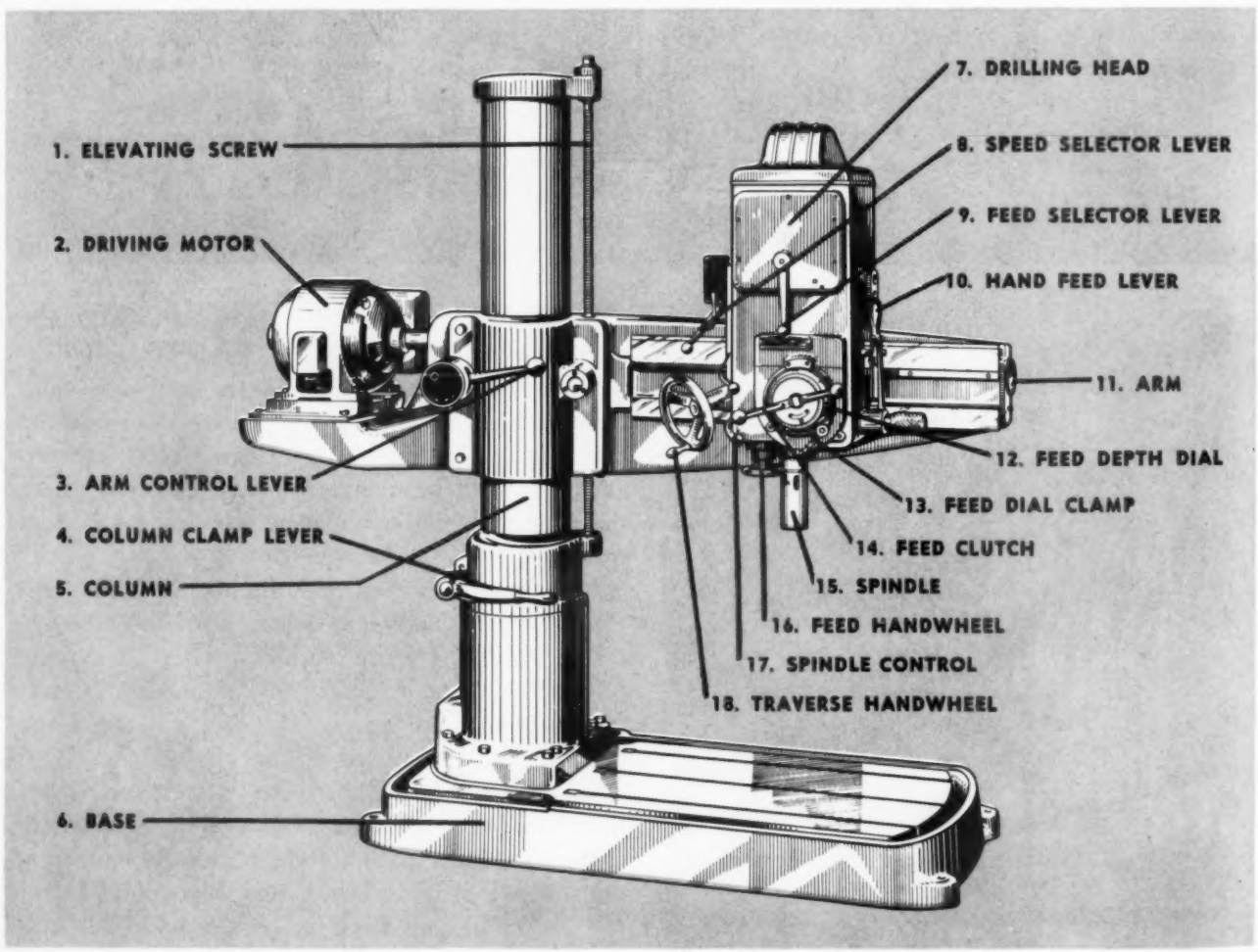
RADIAL DRILL

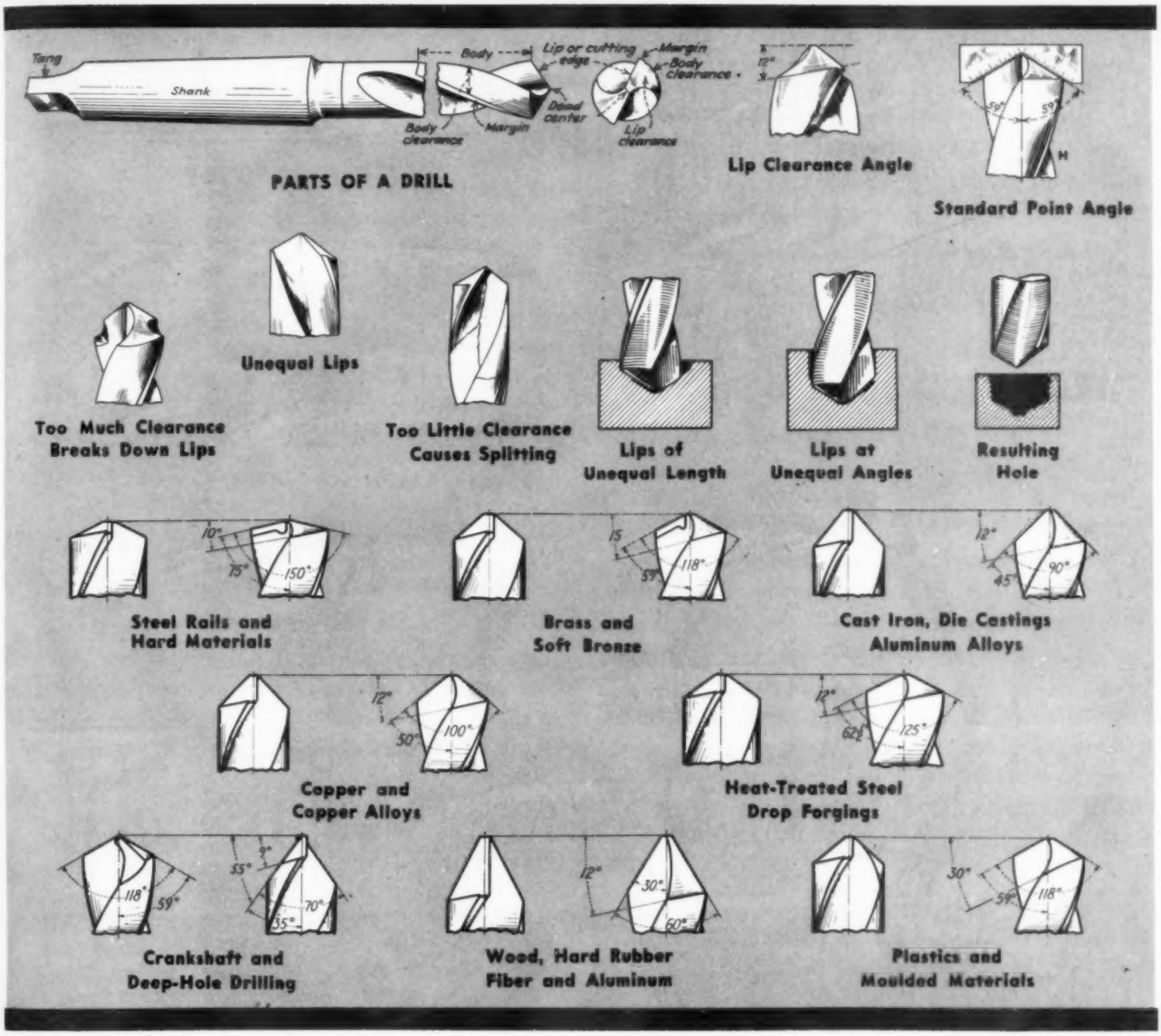
A different type of drilling machine, called a radial drill, has been developed to handle large work. In this type the drilling head (7) is mounted on an arm (11) which swings about the column (5). This arm may also be raised or lowered on the column. Since the arms of these machines range in length from three to twelve or more feet, they can be used on all but the very largest pieces.

Because of the nature of the machine, the operation differs in detail from that of the upright type. The movement of the arm requires different controls and the size of the holes drilled necessitates power feeds almost exclusively. Different manufacturers locate their controls in different places so no standard diagram can be given. However, the illustrated machine is the product of one large manufacturer and can serve as a typical arrangement.

Since the arm, head and motor weigh more than one man can lift, this assembly is raised and lowered by a motor-driven elevating screw (1). Movement of the arm control lever (3) causes the arm to raise or lower or to clamp at the desired height. The drilling head is moved back and forth on the arm by the traverse handwheel (18) which turns a gear that engages a rack on the arm. When the column clamp lever (4) is loosened, the arm may be swung about the column. When the spindle (15) is in position over the work, it may be lowered by means of the feed handwheel (16) or the hand feed lever (10) to check the location. The column clamp lever may then be tightened again.

The spindle speed and feed are easily set by placing the speed and feed selector levers (8 and 9) at the proper marks on their respective scales. The depth of the hole desired is set on the feed depth dial (12) and the feed dial clamp (13) tightened to make it positive. The feed clutch (14) can then be thrown in and the drill fed into the work by moving the spindle control lever (17) to the position for forward speed. When the full depth has been reached, the clutch can be thrown out and the hand feed lever used to raise the drill. If the nature of the work is such that the drill must be backed out of the hole, the spindle lever is simply moved to the position for reverse.



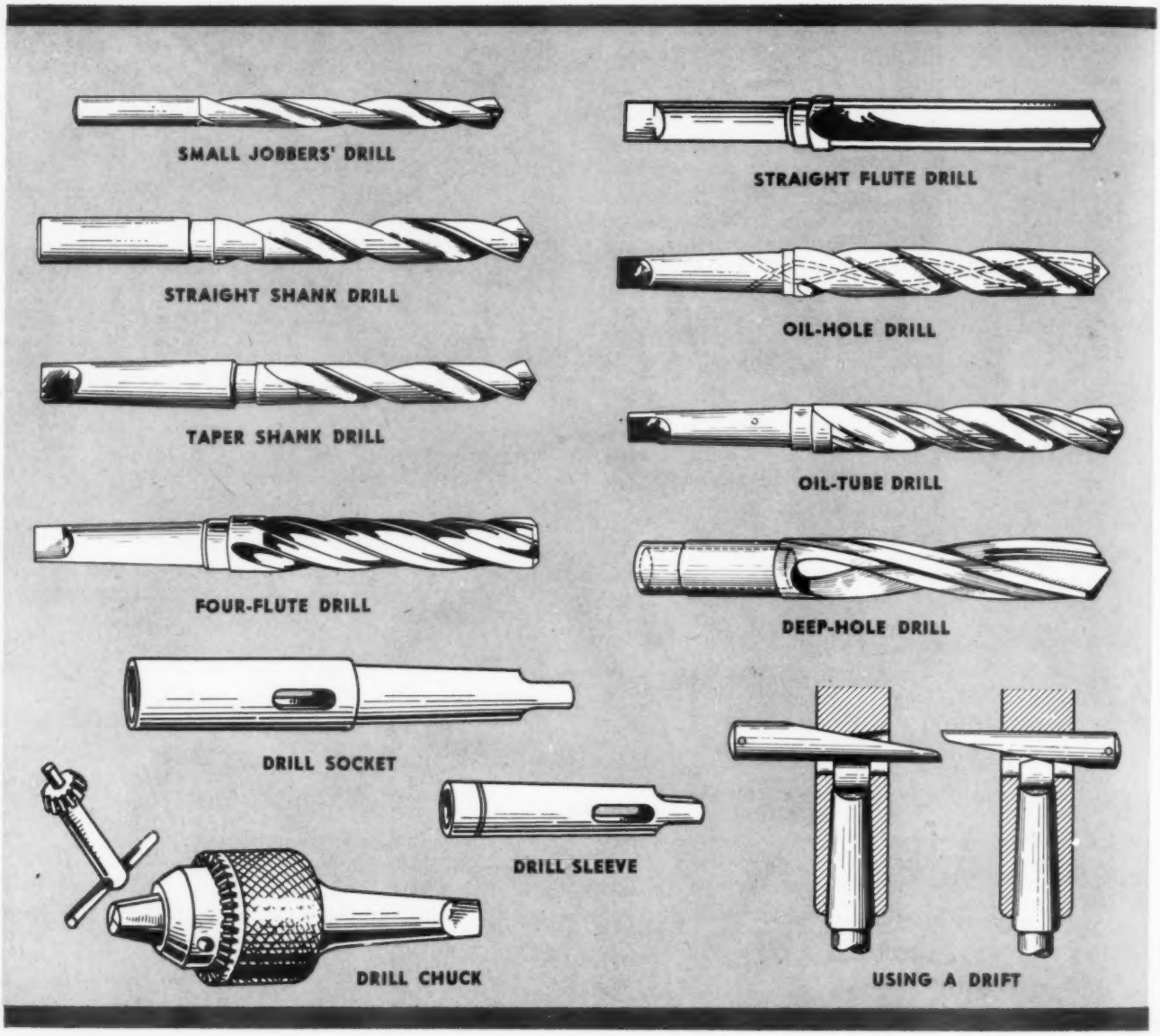


DRILL POINTS

The chief hole-cutting tool is the twist drill. This is a forged cylindrical bar in which two or more spiral (more exactly, helical) grooves are cut and on one end of which a sharp point is carefully ground. The angles ground on the point form chisel edges which bite into the work as the drill turns. As the chips are cut, the helical grooves help them to curl and guide them out of the hole.

The shape of this point is very important. The angles of its surfaces have been determined through long experience with various materials. Drills are regularly supplied with a point having an included angle of 118 deg. and a lip clearance angle of 12 to 15 deg. This drill will handle the bulk of shop work. However, the varied array of materials now available for shop use calls for special points on many occasions. Longer points give faster, smoother production with soft materials; flatter points give longer wear on tools to drill hard, tough steels. To prevent "hogging" into soft brass, the cutting edge is ground with a flat on the front edge. The principal shapes and their uses are shown in the illustration.

With use, all cutting tools become dull, and drills are no exception. When this happens they must be reground. In most modern shops, this will be done by specialists in the toolcrib or tool grinding room with the aid of special drill-grinding machines. Drills can be ground by hand, but this should never be attempted by a novice. Improperly ground drills will wear out quickly, will not cut the right size hole, will not drill straight, and are otherwise unsatisfactory. Some of the more common drilling troubles caused by faulty grinding have been illustrated in the panel.



DRILLS AND CHUCKS

Besides varying in point angles, drills differ in many other respects. Standard drills are made with either straight or taper shanks. Small drills have straight shanks and are held in adjustable chucks. Large drills are made with shanks having standard Morse tapers which fit directly into the drill spindles. The tang on the taper-shank drill fits into a slot in the spindle to assure positive drive. Since taper shanks are made in more than one size they will not all fit the spindle taper. In this case, sleeves or sockets are used to adapt the drill taper to the spindle taper. Taper-shank drills are held in the spindle by friction. They are removed with a flat tapered tool called a drift. How this is done is shown in the illustration.

The standard drill has two helical flutes. But drills with three or four flutes are used to enlarge drilled holes and a drill with straight flutes is sometimes used to drill soft materials. The slope of the flute helix is made tighter on drills for making deep holes in soft materials in order to help remove chips.

Channels for supplying the cutting edge with cooling oil are built into some drills. One type has grooves cut in the body of the drill; another has holes running through the body. For deep-hole drilling where a flood of coolant is required to cool the drill and flush out chips, a special drill having a hollow shank is used. This is not used in the ordinary drill press.

Three classifications of drills are commonly used: Fractional sizes from 1/64 to 1¼ in. by 64ths, to 2¼ in. by 32nds, and to 3½ in. by 16ths; letter sizes from A to Z (0.234 to 0.413 in.); and number drills from 80 to 1 (0.0315 to 0.228 in.). These are made of either carbon steel or high speed steel.

OTHER CUTTERS

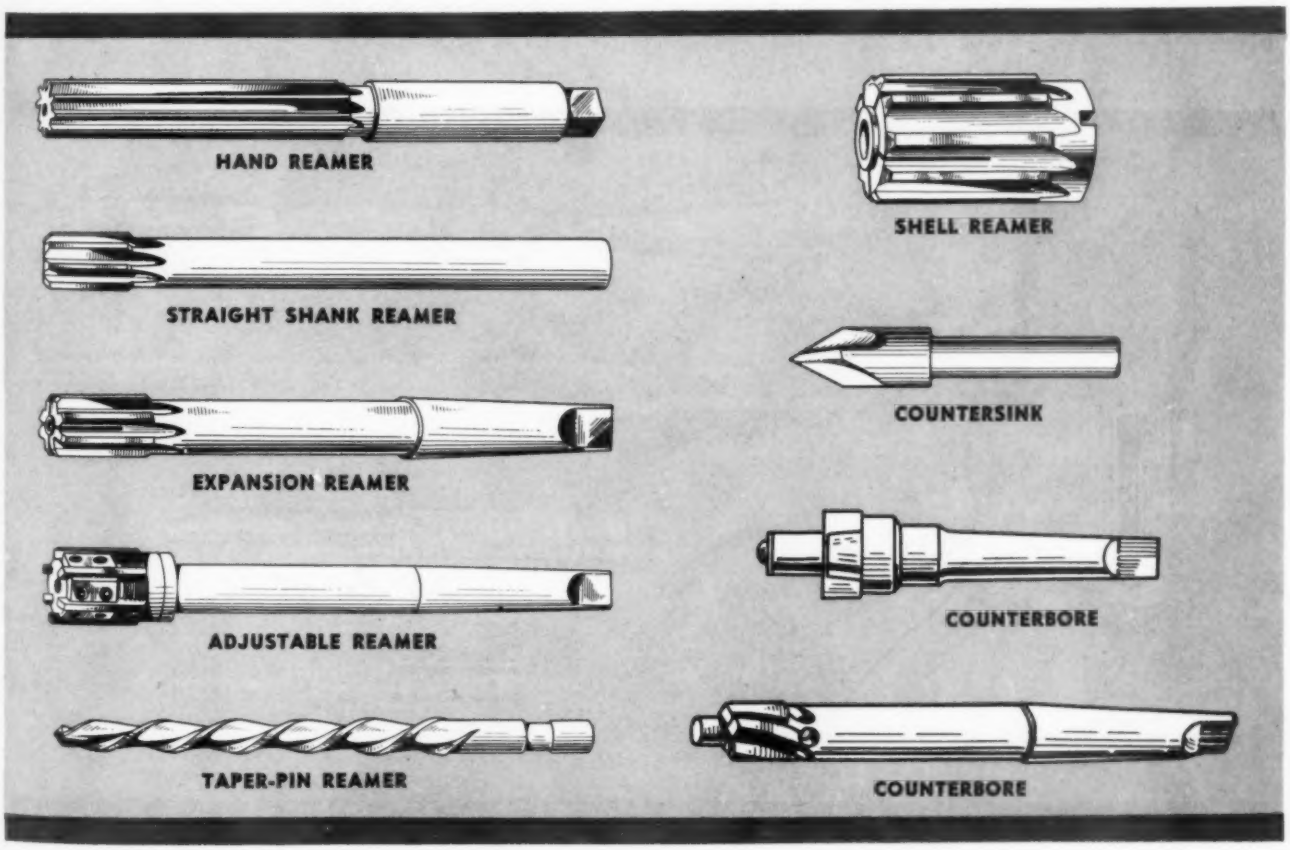
Other cutting tools besides twist drills can be held in the drill spindle. Since it is almost impossible to drill a hole to an exact size, holes are usually drilled about 1/32 in. undersize and reamed to size. For greatest accuracy, the hole may be hand reamed as a final operation.

Reamers are held in the spindle like drills, but they differ in most other respects. Reamers usually cut on the sides rather than the end, the chief exception being the rose reamer. Reamer flutes are either straight or have a slight spiral. Because the cutting edge is so long, reamers should be run slower than drills to avoid overheating.

Various types of reamers are available for different jobs. The hand reamer is a fine finishing tool for bench use after drilling or boring. It is not used in the machine. Rose reamers have cutting teeth only on the end and taper slightly (about 0.001 in.) towards the shank. They are used for enlarging holes before hand reaming. Machine reamers may be either solid, expansion, adjustable or shell types. The body of an expansion reamer is slit. By tightening a tapered screw in the end the diameter is enlarged slightly so that wear may be taken up and the life of the tool extended. Adjustable reamers have separate cutting edges inserted in the reamer body. Small ones have an adjustment of about 1/32 in., large ones ½ in. or over. The adjustable feature also allows for frequent regrinding. Shell reamers are economical since a number of cutting sections can be used on a single shank.

It is often necessary to enlarge the end of a drilled hole. Counterbores and countersinks are used for this purpose. A counterbore often has a pilot section to fit the drilled hole and a larger flat-bottomed cutting section to make a cylindrical enlargement to a specified depth. A countersink has a cone-shaped point and makes a cone-shaped enlargement to take the heads of flathead screws. The usual countersink angle is 82 deg., but 72-deg. tools are made for special purposes, and a 60-deg. countersink is manufactured for reaming center holes. Counterbores are also used to face circular seats around drilled holes and countersinks are sometimes used to remove the burr from a drilled hole.

Internal threads are frequently cut in a drilling machine. The cutting tool used is called a "tap," and the operation "tapping." ("Threading" is a name commonly reserved for cutting external threads.) A tap consists of a cylindrical threaded cutting section and a shank as small or smaller than the minor diameter of the thread. The shank end usually has a square section to take a tap



wrench. Two, three or four flutes are ground along the axis of the tap.

Hand taps are made in sets of three. The starting tap has a taper section about ten threads long to center the tool before cutting. The plug tap has only a short taper section but once started can be used for most tapping jobs. The bottoming tap has only one incomplete tooth. It is used to finish tap blind holes.

The drill press is used as a tapping machine in three ways. First, it is used as a guide in precision hand tapping. A center is mounted in the spindle and the center hole in the shank end of the tap is lined up with it. Enough pressure is maintained on the tap with the hand feed lever to hold it steady without forcing it while the tap is turned into the work by means of a tap wrench.

Actual machine tapping is best done with a special tapping attachment. This is a tap-holding device which has a friction clutch built into it. If the tap sticks, jams on the bottom of a blind hole, or is working under too heavy pressure, the clutch will slip before the tap is broken. Tapping attachments usually have a reversing mechanism for backing out the tap.

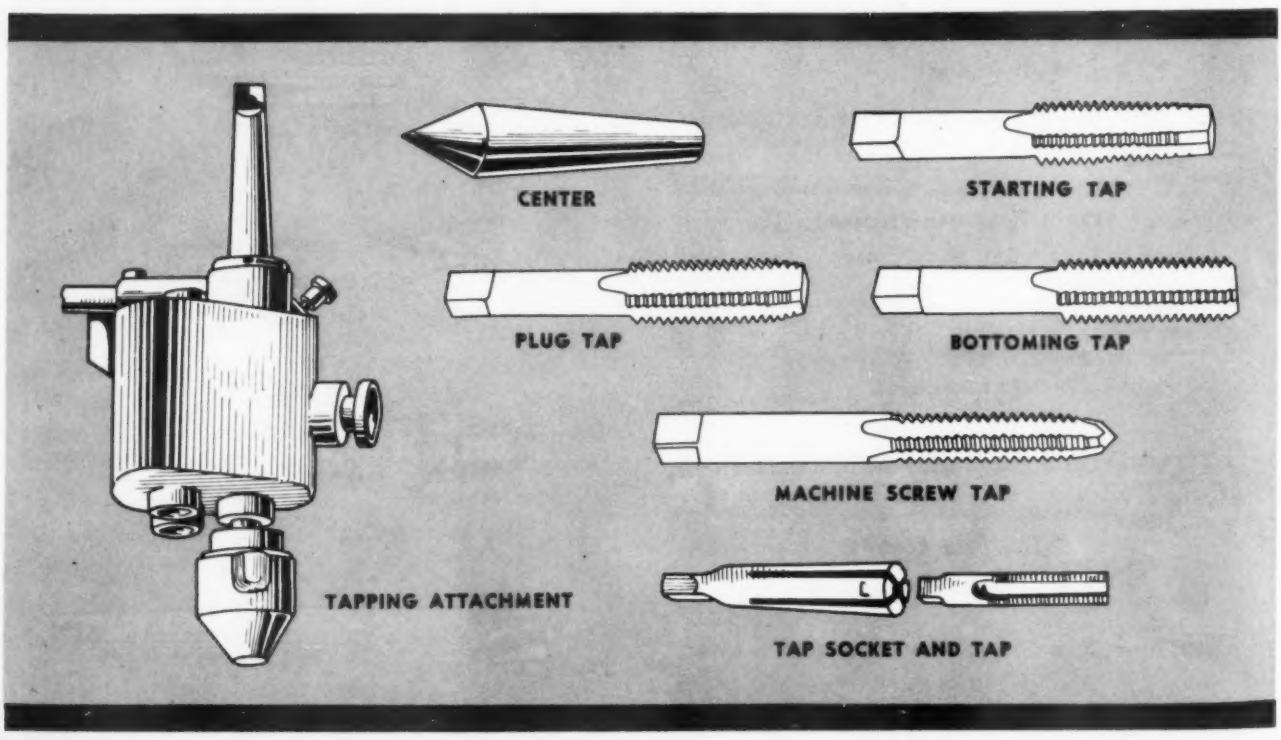
Taps may be held in a tap socket and mounted directly in the spindle of a drill press having back gears when tapping shallow holes which run through the part. The machine should be run at low speed in backgear. If any difficulties arise, a tapping attachment should be used.

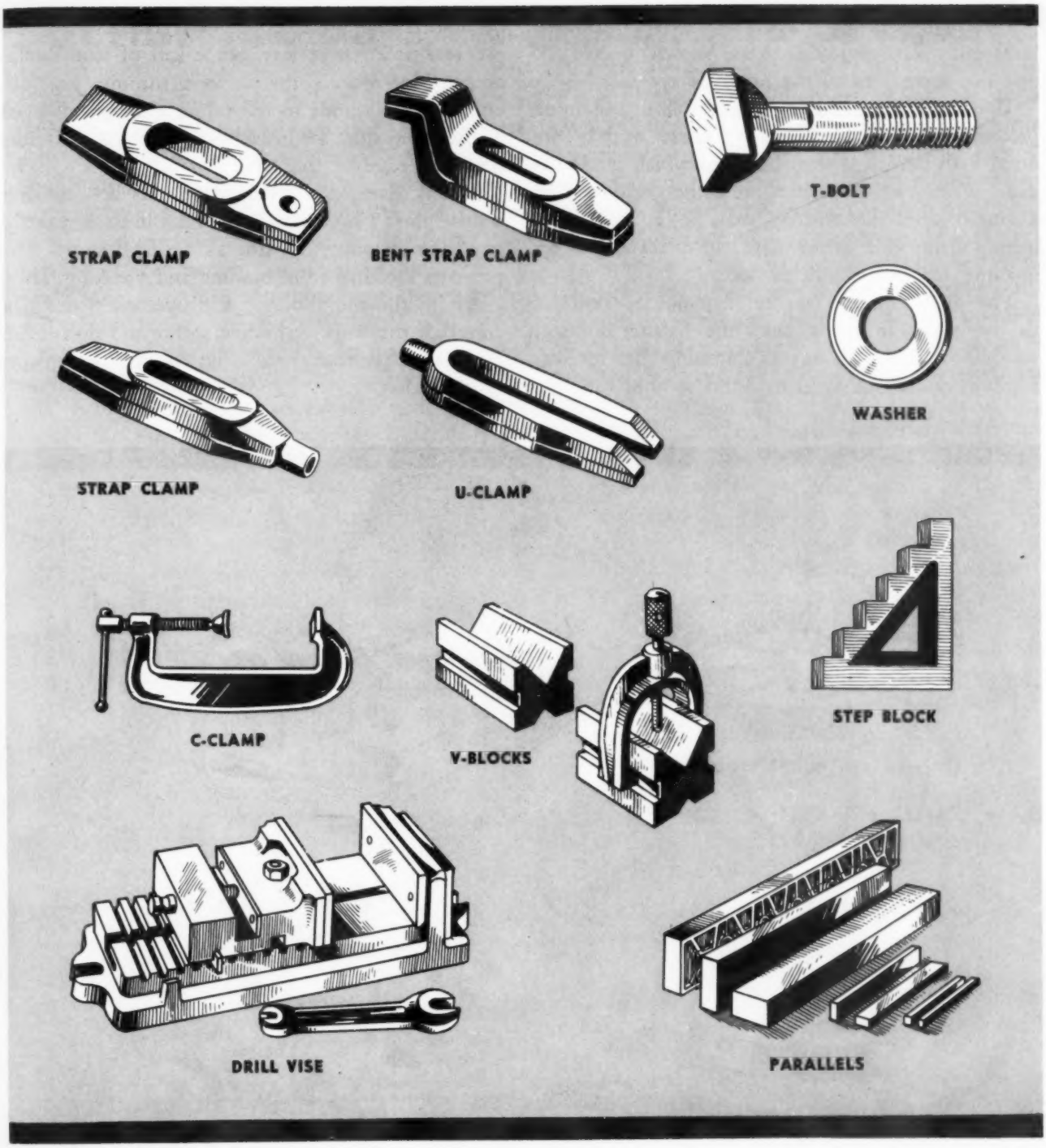
HOLDING DEVICES

Satisfactory work can only be done on a drilling machine when the work is held properly. A variety of devices have been developed to accomplish this. One of the most useful is the drill vise. By using parallels to support the work and occasionally special jaws to hold it, a great variety of jobs can be held in a vise. Beside being very adaptable, the vise can be opened and tightened quickly. This is convenient when many duplicate pieces are to be drilled. Vises are made in several sizes and styles to fit the job to be done.

A variety of clamps, bolts and blocks are available for clamping the work to the machine table, which usually has through slots or T-slots cut in it for this purpose. The clamp may be a flat piece of steel, with a slot or hole cut in it or it may be formed to certain shapes which have been found useful. The shape, size and hardness will vary with the work. The U-strap has an advantage in that it can be adjusted without removing the nut. With the goose-neck or bent strap, the clamping set-up need not extend so high, giving the worker more clearance. The C-clamp is convenient for use on small machines. T-bolts are the usual style used. They are made with strong heads which fit into the table slots. Nuts and washers are used on the threaded end of the bolt.

Work to be clamped is raised above the table on





parallels so that the drill will not cut into the table. The parallels are arranged to give a firm level base for the piece and the clamps then applied. For round pieces, V-blocks are used instead of parallels to hold the work more securely. The free end of the clamp should be supported on parallels or a step block so that the clamp is straight and level.

A clamping set-up should be arranged to hold the piece firmly and to be as convenient as possible to fasten and loosen. To keep the work from "cocking up" and breaking the drill, the bolt should be as close to the work as you can get it without interfering with the job. Typical clamp set-ups are shown in the illustration, but the variety of jobs possible offers a fine chance for the operator to develop set-ups using his own ingenuity.

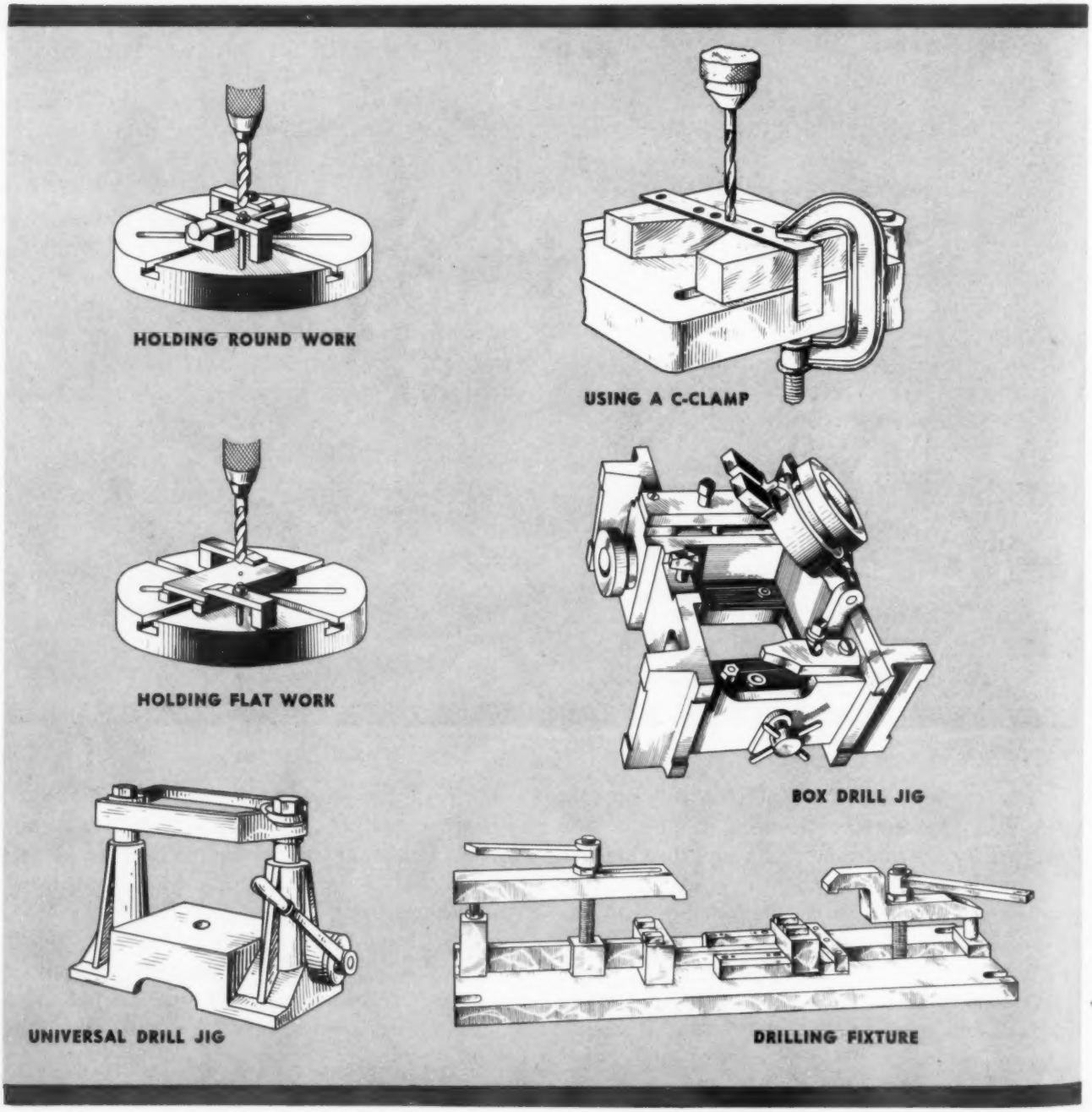
In production work, pieces to be drilled are usually held in drill jigs or fixtures. Strictly speaking, a fixture is a special clamping device for holding a particular part; a jig furnishes a guide for drilling one or more holes. The common drill jig both holds the work and locates the hole. The variety of drill

jigs used in industry is too great to be illustrated here, but a few typical ones are shown to give the operator some idea of the range of types.

The essential part of a jig is a plate containing precisely located guide holes. These usually are fitted with hardened steel bushings which guide the drill. When two operations are to be performed on a single hole, the bushing may be in two parts, having a thin liner which slips out to leave a larger opening for the reamer or tap.

The jig or fixture may or may not be fastened to the table. In many cases the fixture is heavy enough to require no further clamping. Jigs for very light work may be held by hand so that they can be loaded and unloaded quickly. However, a few precautions are necessary. Some sort of stop should be provided to keep the jig from turning. This can be a block clamped to the table, a T-bolt clamped in the table slots, or heavy parallels built out from the back edge of the table.

In any clamping arrangement it is best to have a little play. Thus if the work is not lined up exactly, it is free to move into line as the drill starts. This prevents the drill from binding and breaking. However, in allowing "play", the operator should be sure that the work can move so far and no further. He should see that there is no danger of the work breaking loose.



CUTTING FLUIDS

As a tool cuts into metal the cutting edge becomes very hot. If nothing is done to prevent this, the heat may soften the edge, ruining the tool. A number of liquids, usually oils, have been developed for cooling the tool and work. These pour over the cutting section and carry away the heat. In doing this they prevent undue friction, improve the finish of the work, wash the chips away from the cutting edge, and permit faster cutting speeds.

Mixtures of soluble oil and water make good coolants for most materials. Animal and mineral lard oils, either straight or compounded with kerosene or soluble oil, are also good for general work. Extremely hard or tough materials usually call for oils having a sulphur or chlorinated base. Recommended cutting fluids for drilling, tapping and reaming are given in the accompanying table.

For light drill-press operations, cutting oil may be applied to the work with a squirt can or a small paint brush. For heavy work where a flood of coolant is required, a stream of oil may be poured on the work from a gravity feed tank or a pump system. In deep-hole drilling, the oil may be fed through the drill under heavy pressure.

CUTTING FLUIDS FOR DRILL PRESS WORK

Metal	Drilling	Reaming	Tapping
Machine Steel Hot and Cold Rolled	Soluble or Mineral Lard Oil	Mineral Lard Oil	Soluble Oil Lard Oil
Tool Steel (Carbon and High Speed)	Soluble Oil or Lard Oil with Sulphur	Lard Oil	Sulphur Base or Mineral Lard Oil
Alloy Steel	Soluble Oil Mineral Lard Oil	Lard Oil	Sulphur Base or Mineral Lard Oil
Brass and Bronze	Dry, Lard Oil, or Kerosene Mixture	Soluble Oil	Dry Soluble Oil Lard Oil
Copper	Soluble Oil	Soluble Oil	Soluble Oil or Lard Oil
Aluminum	Kerosene Lard Oil	Mineral Lard Oil	Soluble or Mineral Lard Oil
Monel Metal	Lard Oil Sulphur Base Oil	Mineral Lard Sulphur Base Oil	Mineral Lard or Sulphur Base Oil
Malleable Iron	Soluble Oil	Soluble Oil	Soluble Oil
Cast Iron	Dry	Dry	Small Amount of Mineral Lard Oil

FEEDS AND SPEEDS

For a particular drilling operation, the spindle should rotate at a certain number of revolutions per minute and the drill should advance into the work a certain distance (usually in thousandths of an inch) for each revolution. With a sensitive or hand-fed machine, this is not much of a problem. The spindle is run as fast as it can be without wearing the drill excessively and the proper feed is determined by the feel through the hand feed lever. With power-fed machines, however, both speed and feed are set by control levers and must be determined before starting the job.

Tables of feeds and speeds have been determined for most engineering materials. The best speed at which various metals may be cut is usually expressed in surface feet per minute, in other words, the number of feet of metal the tool passes in a minute. In a drill, this equals the distance the outer corners of the cutting edge travel in a minute. Thus a small drill must rotate much faster than a large one to cut at the same speed. Thus, the operator must know the drill size, the cutting speed for the metal, the feed per revolution and the revolutions per minute. The following tables give this data.

CUTTING SPEEDS FOR VARIOUS METALS

Speed in Feet per Minute

Metal	H. S. Drills	C. S. Drills
Aluminum and Alloys	200—300	80—150
Brass and Bronze	200—300	80—150
Bronze, High Tensile	70—100	30— 50
Cast Iron, Soft	100—150	40— 75
Cast Iron, Medium	70—100	30— 50
Copper	60—100	25— 50
Malleable Iron	80— 90	30— 45
Magnesium and Alloys	250—400	100—200
Monel Metal	40— 50	15— 25
Steel, Machinery	80—100	30— 55
Steel, Annealed	60— 70	25— 35
Steel, Tool	50— 60	20— 30
Steel Forgings	50— 60	20— 30
Steel, Alloy	50— 70	20— 35
Steel, Stainless	60— 70	25— 35

TABLE OF FEEDS

Drill Size (inches)	Feed (per rev.)
1/8 and less	.001 to .002
1/8 to 1/4	.002 to .004
1/4 to 1/2	.004 to .007
1/2 to 1	.007 to .015
1 and larger	.015 to .025

TABLE OF CUTTING SPEEDS

This table is for high-speed drills. Carbon steel drills should be run half as fast. Spindle speeds of more than 150 ft. per min. may be obtained by simple multiplication; that is, the speed for 300 ft. per min. would be twice that for 150, etc.

Feet per Min.		30′	40′	50′	60′	70′	80′	90′	100′	110′	120′	130′	140′	150′
Fractional Size	No. and Letter Size	Revolutions per Minute												
	80	8490	11320	14150	16980	19810	22640	25470	28300	31123	33953	36782	39612	42441
	79	7902	10536	13170	15804	18438	21072	23706	26340	28988	31611	34246	36880	39514
	78	7161	9548	11935	14322	16709	19096	21483	23870	26260	28648	31035	33422	35810
	77	6366	8488	10610	12732	14854	16976	19098	21220	23343	25465	27587	29709	31831
	76	5730	7640	9550	11460	13370	15280	17190	19100	21008	22918	24828	26738	28648
	75	5457	7276	9095	10914	12733	14552	16371	18190	20008	21827	23646	25465	27284
	74	5106	6808	8510	10212	11914	13616	15318	17020	18674	20372	22069	23767	25465
	73	4776	6368	7960	9552	11144	12736	14328	15920	17507	19099	20690	22282	23873
	72	4584	6112	7640	9168	10696	12224	13752	15280	16807	18335	19863	21390	22918
	71	4419	5892	7365	8838	10311	11784	13257	14730	16160	17629	19099	20568	22037
	70	4091	5456	6820	8184	9548	10912	12276	13640	15006	16370	17734	19099	20463
	69	3918	5224	6530	7836	9142	10488	11754	13060	14389	15697	17006	18314	19622
	68	3696	4928	6160	7392	8624	9856	11088	12320	13554	14786	16018	17250	18482
	67	3582	4776	5970	7164	8358	9552	10746	11940	13130	14324	15517	16712	17905
	66	3474	4632	5790	6948	8106	9264	10422	11580	12732	13890	15047	16205	17362
	65	3273	4364	5455	6546	7637	8728	9819	10910	12005	13096	14187	15279	16370
	64	3183	4244	5305	6366	7427	8488	9549	10610	11671	12732	13793	14854	15915
	63	3096	4128	5160	6192	7224	8256	9288	10320	11366	12398	13421	14453	15485
	62	3015	4020	5025	6030	7035	8040	9045	10050	11057	12060	13068	14073	15078
	61	2938	3918	4897	5876	6856	7835	8815	9794	10774	11753	12732	13712	14691
	60	2865	3820	4775	5729	6684	7639	8594	9549	10504	11459	12414	13369	14324
	59	2795	3726	4658	5590	6521	7453	8388	9316	10248	11180	12111	13043	13975
	58	2729	3637	4547	5456	6367	7275	8186	9095	10004	10913	11823	12732	13642
	57	2671	3561	4452	5342	6232	7122	8013	8903	9771	10660	11548	12436	13325
	56	2465	3286	4108	4929	5751	6572	7394	8215	9036	9857	10678	11500	12322
	55	2204	2938	3673	4408	5142	5877	6611	7346	8080	8815	9549	10284	11028
	54	2084	2778	3473	4167	4862	5556	6251	6945	7639	8334	9028	9723	10417
	53	1924	2566	3207	3848	4490	5131	5773	6414	7062	7704	8346	8988	9630
1/16		1833	2445	3056	3667	4278	4889	5500	6111	6722	7334	7945	8556	9167
	52	1805	2406	3008	3609	4211	4812	5414	6015	6619	7218	7820	8421	9023
	51	1710	2280	2851	3421	3991	4561	5131	5701	6271	6841	7413	7982	8552
	50	1637	2183	2729	3274	3820	4366	4911	5457	6002	6548	7094	7640	8185
	49	1570	2093	2617	3140	3663	4186	4710	5233	5756	6279	6808	7326	7849
	48	1508	2010	2513	3016	3518	4021	4523	5026	5528	6031	6534	7036	7539
	47	1460	1946	2433	2920	3406	3893	4379	4866	5352	5839	6326	6812	7299
	46	1415	1886	2358	2830	3301	3773	4244	4716	5187	5659	6130	6602	7074
	45	1397	1863	2329	2795	3261	3726	4192	4658	5124	5590	6056	6522	6987
	44	1333	1777	2221	2665	3109	3554	3999	4442	4886	5330	5774	6218	6662
	43	1288	1717	2146	2575	3004	3434	3863	4292	4721	5150	5579	6008	6438
	42	1226	1634	2043	2451	2860	3268	3677	4085	4494	4902	5311	5719	6128
	41	1194	1592	1990	2387	2785	3183	3581	3979	4377	4775	5172	5570	5968
	40	1169	1559	1949	2339	2729	3118	3508	3898	4287	4677	5067	5457	5846
	39	1152	1536	1920	2303	2687	3071	3455	3839	4222	4607	4991	5374	5758
	38	1129	1505	1882	2258	2634	3010	3387	3763	4140	4516	4892	5269	5645
	37	1102	1469	1837	2204	2571	2938	3306	3673	4040	4407	4775	5142	5509
	36	1076	1435	1794	2152	2511	2870	3228	3587	3945	4304	4663	5021	5380
	35	1042	1389	1736	2083	2430	2778	3125	3472	3821	4167	4514	4861	5209
	34	1032	1376	1721	2065	2409	2753	3097	3442	3785	4129	4474	4818	5162
	33	1014	1352	1690	2028	2366	2704	3042	3380	3718	4056	4394	4732	5070
	32	988	1317	1647	1976	2305	2634	2964	3293	3622	3951	4281	4610	4939
	31	955	1273	1592	1910	2228	2546	2865	3183	3501	3821	4138	4456	4775
1/8		917	1222	1528	1833	2139	2445	2750	3056	3361	3667	3973	4278	4584
	30	892	1189	1487	1784	2081	2378	2676	2973	3270	3567	3864	4162	4459
	29	843	1124	1405	1685	1966	2247	2528	2809	3090	3370	3651	3932	4213
	28	816	1088	1360	1631	1903	2175	2447	2719	2990	3262	3534	3806	4078
	27	796	1061	1327	1592	1857	2122	2388	2653	2919	3183	3448	3714	3979
	26	779	1039	1299	1559	1819	2078	2338	2598	2858	3118	3378	3638	3898
	25	767	1022	1276	1533	1789	2044	2300	2555	2810	3066	3322	3577	3832
	24	754	1005	1257	1508	1759	2010	2262	2513	2764	3016	3267	3518	3769
	23	744	992	1240	1488	1736	1984	2232	2480	2728	2976	3224	3472	3720
	22	730	973	1217	1460	1703	1946	2190	2433	2676	2920	3164	3406	3649
	21	721	961	1201	1441	1681	1922	2162	2402	2644	2883	3123	3363	3604
	20	712	949	1186	1423	1660	1898	2135	2372	2610	2847	3084	3322	3559

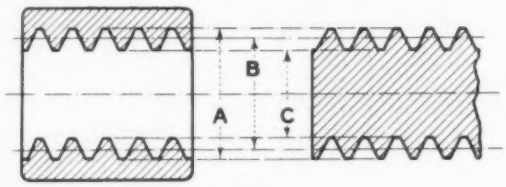
In the newest drill standards, decimal sizes replace letter and

TABLE OF CUTTING SPEEDS *(continued)*

Feet per Min.		30′	40′	50′	60′	70′	80′	90′	100′	110′	120′	130′	140′	150′
Fractional Size	No. and Letter Size	Revolutions per Minute												
	19	690	920	1151	1381	1611	1841	2071	2301	2531	2761	2991	3222	3453
	18	678	904	1130	1356	1582	1808	2034	2260	2479	2704	2930	3155	3380
	17	662	883	1104	1325	1546	1766	1987	2208	2429	2650	2870	3091	3313
	16	647	863	1079	1295	1511	1726	1942	2158	2374	2590	2806	3021	3237
	15	638	851	1064	1276	1489	1702	1914	2127	2334	2546	2759	2971	3183
	14	630	840	1050	1259	1469	1679	1889	2099	2309	2518	2728	2938	3148
	13	620	826	1032	1239	1450	1652	1859	2065	2271	2479	2684	2891	3097
3/16		611	815	1019	1222	1426	1630	1833	2037	2241	2445	2648	2852	3056
	12	606	808	1010	1213	1415	1617	1819	2021	2223	2425	2627	2829	3032
	11	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3001
	10	592	790	987	1184	1382	1579	1777	1974	2171	2369	2566	2764	2961
	9	585	780	975	1169	1364	1559	1754	1949	2144	2339	2534	2728	2923
	8	576	768	960	1151	1343	1535	1727	1919	2111	2303	2495	2687	2879
	7	570	760	950	1140	1330	1520	1710	1900	2090	2281	2470	2660	2850
	6	562	749	936	1123	1310	1498	1685	1872	2060	2247	2434	2621	2809
	5	558	744	930	1115	1301	1487	1673	1859	2045	2230	2416	2602	2788
	4	548	731	914	1097	1280	1462	1645	1828	2010	2193	2376	2560	2741
	3	538	717	897	1076	1255	1434	1614	1793	1974	2152	2331	2511	2690
	2	518	691	864	1037	1210	1382	1555	1728	1901	2074	2247	2420	2593
	1	503	670	838	1005	1173	1340	1508	1675	1843	2010	2179	2346	2513
	A	491	654	818	982	1145	1309	1472	1636	1796	1959	2122	2285	2448
	B	482	642	803	963	1124	1284	1445	1605	1765	1926	2086	2247	2407
	C	473	631	789	947	1105	1262	1420	1578	1736	1894	2052	2210	2368
	D	467	622	778	934	1089	1245	1400	1556	1708	1863	2018	2174	2329
1/4	E	458	611	764	917	1070	1222	1375	1528	1681	1834	1968	2139	2292
	F	446	594	743	892	1040	1189	1337	1486	1635	1784	1932	2081	2229
	G	440	585	732	878	1024	1170	1317	1463	1610	1756	1903	2049	2195
	H	430	574	718	862	1005	1149	1292	1436	1580	1723	1867	2010	2154
	I	421	562	702	842	983	1123	1264	1404	1545	1685	1826	1966	2106
	J	414	552	690	827	965	1103	1241	1379	1517	1655	1793	1930	2068
	K	408	544	680	815	951	1087	1223	1359	1495	1631	1767	1903	2039
	L	395	527	659	790	922	1054	1185	1317	1449	1581	1712	1844	1976
	M	389	518	648	777	907	1036	1166	1295	1424	1554	1683	1813	1942
	N	380	506	633	759	886	1012	1139	1265	1391	1518	1644	1771	1897
5/16		367	489	611	733	856	978	1100	1222	1345	1467	1589	1711	1833
	O	363	484	605	725	846	967	1088	1209	1330	1450	1571	1692	1813
	P	355	473	592	710	828	946	1065	1183	1301	1419	1537	1657	1774
	Q	345	460	575	690	805	920	1035	1150	1266	1384	1496	1611	1726
	R	338	451	564	676	789	902	1014	1127	1239	1355	1465	1577	1690
	S	329	439	549	659	769	878	988	1098	1207	1317	1427	1537	1646
	T	320	426	533	640	746	853	959	1066	1173	1280	1387	1494	1600
	U	311	415	519	623	727	830	934	1038	1142	1246	1349	1453	1557
3/8		306	407	509	611	713	815	917	1019	1120	1222	1324	1426	1528
	V	304	405	507	608	709	810	912	1013	1114	1219	1317	1418	1520
	W	297	396	495	594	693	792	891	989	1088	1188	1286	1385	1484
	X	289	385	481	576	672	769	865	962	1058	1155	1251	1347	1443
	Y	284	378	473	567	662	756	851	945	1040	1135	1229	1324	1418
	Z	277	370	462	555	647	740	832	925	1017	1110	1202	1295	1387
7/16		262	349	437	524	611	698	786	873	960	1048	1135	1222	1310
1/2		229	306	382	458	535	611	688	764	840	917	993	1070	1146
5/8		183	244	306	367	428	489	550	611	672	733	794	856	917
3/4		153	203	255	306	357	407	458	509	560	611	662	713	764
7/8		131	175	218	262	306	349	393	436	480	524	568	611	655
1″		115	153	191	229	267	306	344	382	420	458	497	535	573
1 1/8		102	136	170	204	238	272	306	340	373	407	441	475	509
1 1/4		92	122	153	183	214	244	275	306	336	367	397	428	458
1 3/8		83	111	139	167	194	222	250	278	306	333	361	389	417
1 1/2		76	102	127	153	178	204	229	255	280	306	331	357	382
1 5/8		70	94	117	141	165	188	212	235	259	282	306	329	353
1 3/4		65	87	109	131	153	175	196	218	240	262	284	306	327
1 7/8		61	81	102	122	143	163	183	204	224	244	265	285	306
2″		57	76	95	115	134	153	172	191	210	229	248	267	287
2 1/4		51	68	85	102	119	136	153	170	187	204	221	238	255
2 1/2		46	61	76	92	107	122	137	153	168	183	199	214	229
2 3/4		42	56	69	83	97	111	125	139	153	167	181	194	208
3″		38	51	64	76	89	102	115	127	140	153	166	178	191

number sizes. These are not yet widely used, however

BASIC THREAD DIMENSIONS AND TAP DRILL SIZES



A = Major Diameter
B = Pitch Diameter
C = Minor Diameter

Nominal Size	Thread Series	Major Diam., In. A	Pitch Diam., In. B	Root Diam., In. C	Tap Drill for Approx. 75% Full Thread	Decimal Equiv. of Tap Drill
0—80	N. F.	.0600	.0519	.0438	3/64	.0469
1—56	N. S.	.0730	.0614	.0498	54	.0550
64	N. C.	.0730	.0629	.0527	53	.0595
72	N. F.	.0730	.0640	.0550	53	.0595
2—56	N. C.	.0860	.0744	.0628	50	.0700
64	N. F.	.0860	.0759	.0657	50	.0700
3—48	N. C.	.0990	.0855	.0719	47	.0785
56	N. F.	.0990	.0874	.0758	45	.0820
4—32	N. S.	.1120	.0917	.0714	45	.0820
36	N. S.	.1120	.0940	.0759	44	.0860
40	N. C.	.1120	.0958	.0795	43	.0890
48	N. F.	.1120	.0985	.0849	42	.0935
5—36	N. S.	.1250	.1070	.0889	40	.0980
40	N. C.	.1250	.1088	.0925	38	.1015
44	N. F.	.1250	.1102	.0955	37	.1040
6—32	N. C.	.1380	.1177	.0974	36	.1065
36	N. S.	.1380	.1200	.1019	34	.1110
40	N. F.	.1380	.1218	.1055	33	.1130
7—32	N. S.	.1510	.1307	.1104	31	.1200
8—30	N. S.	.1640	.1423	.1207	30	.1285
32	N. C.	.1640	.1437	.1234	29	.1360
36	N. F.	.1640	.1460	.1279	29	.1360
40	N. S.	.1640	.1478	.1315	28	.1405
9—32	N. S.	.1770	.1567	.1364	26	.1470
10—24	N. C.	.1900	.1629	.1359	25	.1495
28	N. S.	.1900	.1668	.1436	23	.1540
30	N. S.	.1900	.1684	.1467	22	.1570
32	N. F.	.1900	.1697	.1494	21	.1590
12—24	N. C.	.2160	.1889	.1619	16	.1770
28	N. F.	.2160	.1928	.1696	14	.1820
32	N. S.	.2160	.1957	.1754	13	.1850
14—20	N. S.	.2420	.2095	.1770	10	.1935
24	N. S.	.2420	.2149	.1879	7	.2010
16—18	N. S.	.2680	.2319	.1958	3	.2130
18—18	N. S.	.2940	.2579	.2218	B	.2380
1/16—64	N. S.	.0625	.0524	.0422	3/64	.0469
5/64—60	N. S.	.0781	.0673	.0563	1/16	.0625
3/32—48	N. S.	.0938	.0803	.0667	49	.0730
50	N. S.	.0938	.0808	.0678	49	.0730
7/64—48	N. S.	.1094	.0959	.0823	43	.0890
1/8—40	N. S.	.1250	.1088	.0925	38	.1015
9/64—40	N. S.	.1406	.1244	.1081	32	.1160
5/32—32	N. S.	.1563	.1360	.1157	1/8	.1250
36	N. S.	.1563	.1382	.1202	30	.1285
11/64—32	N. S.	.1719	.1516	.1313	9/64	.1406
3/16—24	N. S.	.1875	.1604	.1334	26	.1470
32	N. S.	.1875	.1672	.1469	22	.1570
13/64—24	N. S.	.2031	.1760	.1490	20	.1610
7/32—24	N. S.	.2188	.1917	.1646	16	.1770
32	N. S.	.2188	.1985	.1782	12	.1890
15/64—24	N. S.	.2344	.2073	.1806	10	.1935
1/4—20	N. C.	.2500	.2175	.1850	7	.2010
24	N. S.	.2500	.2229	.1959	4	.2090
27	N. S.	.2500	.2260	.2019	3	.2130
28	N. F.	.2500	.2268	.2036	3	.2130
32	N. S.	.2500	.2297	.2094	7/32	.2188
5/16—18	N. C.	.3125	.2764	.2403	F	.2570
20	N. S.	.3125	.2800	.2476	17/64	.2656
24	N. F.	.3125	.2854	.2584	I	.2720
27	N. S.	.3125	.2884	.2644	J	.2770
32	N. S.	.3125	.2922	.2719	9/32	.2812
3/8—16	N. C.	.3750	.3344	.2938	5/16	.3125
20	N. S.	.3750	.3425	.3100	21/64	.3281
24	N. F.	.3750	.3479	.3209	Q	.3320
27	N. S.	.3750	.3509	.3269	R	.3390
7/16—14	N. C.	.4375	.3911	.3447	U	.3680
20	N. F.	.4375	.4050	.3726	25/64	.3906
24	N. S.	.4375	.4104	.3834	X	.3970
27	N. S.	.4375	.4134	.3894	Y	.4040
1/2—12	N. S.	.5000	.4459	.3918	27/64	.4219
13	N. C.	.5000	.4500	.4001	27/64	.4219
20	N. F.	.5000	.4675	.4351	29/64	.4531
24	N. S.	.5000	.4729	.4459	29/64	.4531
27	N. S.	.5000	.4759	.4519	15/32	.4687
9/16—12	N. C.	.5625	.5084	.4542	31/64	.4844
18	N. F.	.5625	.5264	.4903	33/64	.5156
27	N. S.	.5625	.5384	.5144	17/32	.5312
5/8—11	N. C.	.6250	.5660	.5069	17/32	.5312
12	N. S.	.6250	.5709	.5168	35/64	.5469
18	N. F.	.6250	.5889	.5528	37/64	.5781
27	N. S.	.6250	.6009	.5769	19/32	.5937
11/16—11	N. S.	.6875	.6285	.5694	19/32	.5937
16	N. S.	.6875	.6469	.6063	5/8	.6250
3/4—10	N. C.	.7500	.6850	.6201	21/32	.6562
12	N. S.	.7500	.6959	.6418	43/64	.6719
16	N. F.	.7500	.7094	.6688	11/16	.6875
27	N. S.	.7500	.7259	.7019	23/32	.7187
13/16—10	N. S.	.8125	.7476	.6826	23/32	.7187
7/8— 9	N. C.	.8750	.8028	.7307	49/64	.7656
12	N. S.	.8750	.8209	.7668	51/64	.7969
14	N. F.	.8750	.8286	.7822	13/16	.8125
18	N. S.	.8750	.8389	.8028	53/64	.8281
27	N. S.	.8750	.8509	.8269	27/32	.8437
15/16— 9	N. S.	.9375	.8654	.7932	53/64	.8281
1 — 8	N. C.	1.0000	.9188	.8376	7/8	.8750
12	N. S.	1.0000	.9459	.8918	59/64	.9219
14	N. F.	1.0000	.9536	.9072	15/16	.9375
27	N. S.	1.0000	.9759	.9519	31/32	.9687
1 1/8— 7	N. C.	1.1250	1.0322	.9394	63/64	.9844
12	N. F.	1.1250	1.0709	1.0168	1 3/64	1.0469
1 1/4— 7	N. C.	1.2500	1.1572	1.0644	1 7/64	1.1094
12	N. F.	1.2500	1.1959	1.1418	1 11/64	1.1719
1 3/8— 6	N. C.	1.3750	1.2667	1.1585	1 7/32	1.2187
12	N. F.	1.3750	1.3209	1.2668	1 19/64	1.2969
1 1/2— 6	N. C.	1.5000	1.3917	1.2835	1 11/32	1.3437
12	N. F.	1.5000	1.4459	1.3918	1 27/64	1.4219
1 5/8— 5 1/2	N. S.	1.6250	1.5069	1.3888	1 29/64	1.4531
1 3/4— 5	N. C.	1.7500	1.6201	1.4902	1 9/16	1.5625
1 7/8— 5	N. S.	1.8750	1.7451	1.6152	1 11/16	1.6875
2 — 4 1/2	N. C.	2.0000	1.8557	1.7113	1 25/32	1.7812
2 1/8— 4 1/2	N. S.	2.1250	1.9807	1.8363	1 29/32	1.9062
2 1/4— 4 1/2	N. C.	2.2500	2.1057	1.9613	2 1/32	2.0312
2 3/8— 4	N. S.	2.3750	2.2126	2.0502	2 1/8	2.1250
2 1/2— 4	N. C.	2.5000	2.3376	2.1752	2 1/4	2.2500
2 3/4— 4	N. C.	2.7500	2.5876	2.4252	2 1/2	2.5000
3 — 4	N. C.	3.0000	2.8376	2.6752	2 3/4	2.7500

TAP DRILL SIZES

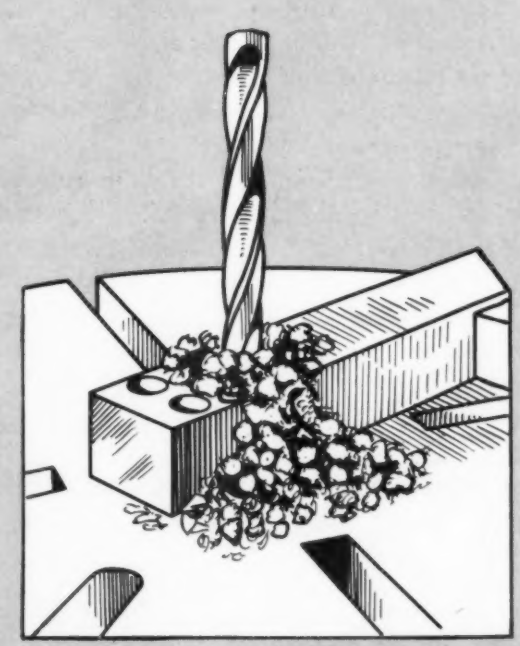
When a thread is to be cut on the inside of a hole, some metal must be left by the drill to form the thread. Theoretically, the hole should be drilled the exact size of the minor diameter of the thread, leaving the difference between the major and minor diameters to form the thread. Actually, if this were done, the thread would fit too tight. Therefore, the hole is drilled slightly larger than the minor diameter to leave about 75 percent of the difference. This will form a satisfactory thread for most materials. In precise work it will be found that different materials require different percentages of thread. Where exact specifications are necessary, they will be supplied by your foreman or your operations sheet.

The threads commonly used in the United States belong to the American National Thread Series. The form, number and dimensions of these threads have been decided upon as standard by American engineering and standards societies. Three classes of threads are specified: National Coarse, National Fine, and National Special. These are indicated on the blueprint by the letters NC, NF and NS. For example, a ¾ in. nut having ten threads per inch in the National Coarse Thread Series would be specified as ¾-10-NC.

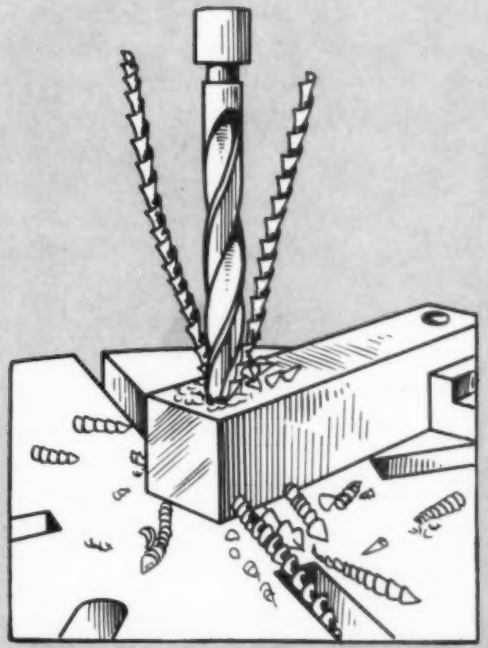
On the facing page a table of tap drill sizes is given for your convenience. From this you will be able to find the right drill to use before any standard machine tap. At the left side is given the size, number and class of thread. The center three columns give the basic thread dimensions. The last two columns give the tap drill size and its decimal equivalent.

DRILLING SENSE

To be a drill-press operator, it is not enough to know what a drilling machine is and how it works, or to be able to recognize some of the tools that are used in it. There is still a lot to learn, most of which can only be picked up in running the machine. You will have to know how to use all your senses on the job: to be able to tell from the feel through the feed lever just how the tool is cutting; to tell from the sound whether it is cutting freely or is laboring; to recognize from the appearance of the chips



CHIPS FORMED IN DRILLING CAST IRON



CHIPS FORMED IN DRILLING STEEL

whether the drill is sharp or dull. This knowledge is the product of experience: you cannot acquire it from books. To help you acquire it quickly, the following hints are given:

If the cutting edge breaks down quickly, either the feed is too heavy or the clearance angle is too great.

If the drill splits, the feed is too heavy or the clearance angle is too small.

If the drill dulls rapidly, especially at the outer corners, it is being run too fast.

Squeaking indicates friction. The hole may be crooked. The drill or reamer may be dull and not cutting. It may not be getting cutting oil.

Groaning indicates overloading. Dull tools, lack of clearance, overfeeding, or chips under the cutting edge may be the cause.

Make sure the drill is running straight before beginning the cut. If it wabbles, the drill may be bent. The shank may be worn. It may not be held properly in the spindle or chuck. The point angles may be improperly ground.

Starting a drill slowly will give a better hole. Let it cut its way; don't try to punch out holes.

Finishing a through hole is the most dangerous operation on a drill press. The tendency is to bear down on the feed as you approach the opposite surface so as to cut through faster. Avoid this. It is better to let up on the feed as you break through so that the drill cuts its way. Punching out holes means large burrs on the work and creates the danger of the drill binding in the hole and breaking.

In placing taper-shank drills in the spindle, be sure that both shank and spindle are clean and smooth. Broken tangs can result when the fit is imperfect.

Cast iron is usually drilled dry, but when it contains a number of hard, sand inclusions, kerosene applied with a squirt can will save the drill and help it cut.

Kerosene is also a good cutting fluid for use in drilling deep holes in air-hardening tool steels.

All coolants should be kept as clean as possible, both for the sake of the operator and his tools. Dirty coolants are a source of infection for small cuts in the worker's hands. Chips in the cutting fluid may act as an abrasive to dull the drill.

Flying chips are always a danger. Do not let long curls of steel develop as the tool cuts. But do not try to break them with your bare hand. Chips can cut badly. An open-end wrench or drill drift makes a handy tool for the job. Run it down beside the drill to strike and break the chips.

Never brush chips away from the work with your hand. You may save the trouble of reaching for a brush but cost yourself a cut hand.

OTHER OPERATIONS

The drill press is a versatile tool. It can be used for many small jobs not commonly thought of as drill-press operations. Among these are honing, lapping, sanding, keyseating and flycutting. Even small end-milling jobs can be adapted to the drilling machine. Special tools are manufactured for these jobs. They have either straight shanks to be held in a chuck or taper shanks for insertion in the spindle.

Honing consists of smoothly finishing a surface by rubbing it with an oil stone. The drill-press tool has a series of stones mounted around a cylindrical shank. Lapping is also a finishing operation. A rotating flat plate is used for flat surfaces; cylindrical rods for round holes. The cutting surface may be faced with cloth to which abrasive powder is applied. Sanding is done with abrasive cloth or paper held on a length of drill rod.

Keyseating and flycutting are cutting operations. Keyseats are slots cut in round holes to receive bars or keys which fasten the piece to a shaft. They are cut with a special tool having a small milling cutter mounted parallel to the axis of the hole. Flycutters are single-tooth cutters mounted at right angles to the shank. They are used for counterboring or for cutting recesses in drilled holes.

In preparing this section we have had the advantage of information and illustrative material supplied by the following manufacturers:

Avey Drilling Machine Co.
Baker Bros., Inc.
W. F. and John Barnes Co.
Chicago-Latrobe Twist Drill Works
Cincinnati Bickford Tool Co.
Cleveland Twist Drill Co.
Cleveland Universal Jig Co.
Delta Manufacturing Co.
Morse Twist Drill & Machine Co.
National Twist Drill & Tool Co.
Pratt & Whitney Div., Niles-Bement-Pond
Union Twist Drill Co.

Shell Made in Small Shop

By E. G. COLLINS
Superintendent, Shell Department
Anderson Brass Works, Incorporated

SMALL SHOPS having the requisite experience in making metal parts to relatively close dimensional tolerances are, in many instances, playing an important part on the production front. In normal times, the Anderson Brass Works manufactures bronze electrical distribution connectors, marketing these items to electrical manufacturers and electrical utilities all over the country. Back in 1941 the company employed from 100 to 110 men in the foundry and machine shop. Today, approximately the same number of employees are working in the plant, but most of them are making war products. Only a small percentage of our present activity is devoted to the manufacture of such distribution connectors as are needed to supply war contractors.

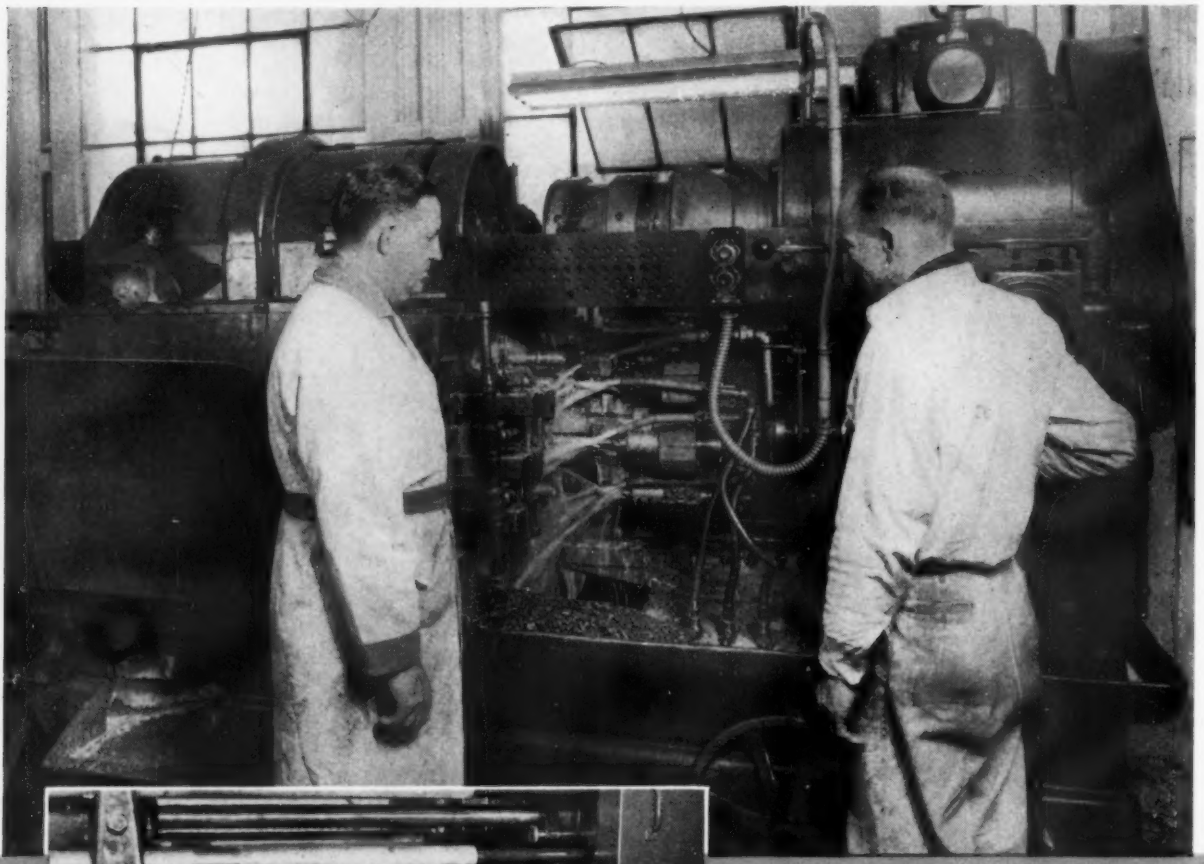
Until we started to make high-explosive 37-mm. shell some months ago, none of our production equipment was employed in machining steel parts. It was necessary to set up a separate department to handle the production of these shell, and to train a group of operators and inspectors on the operations involved.

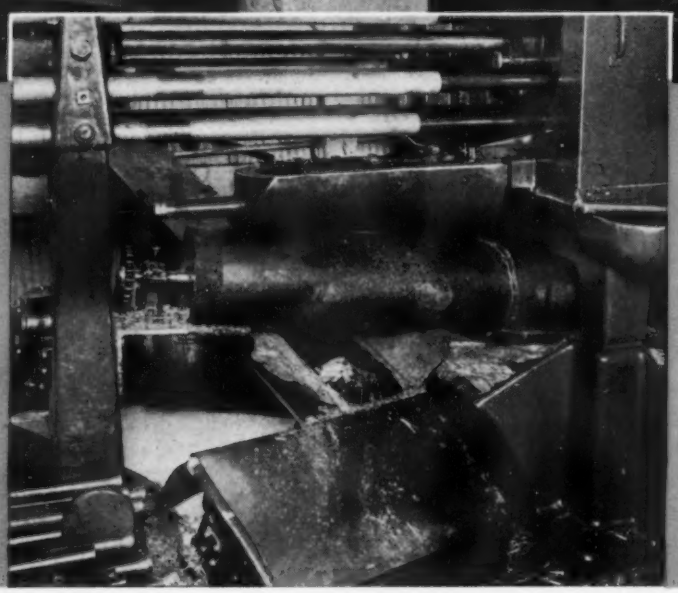
Today, almost all of the production employees in

the shell department are women who have been trained on the job to handle one or more of the necessary operations. Some of these girls have learned to set their own tools, but in most instances the machines are set up and checked by men from the small toolroom maintained by the department. This toolroom makes all of the special cutting tools and collets used in the department, and the toolmakers are responsible for the proper operation of the various production machines.

The projectile has a solid nose and is drilled and tapped in the base end for the explosive charge and the base fuze. Only a few machining operations are necessary, and it has been possible to arrange the necessary production equipment in a straight line so as to minimize handling between operations. The shell bodies are, in most cases, moved from operation to operation in wood trays until they reach the final inspection bench. From there, the shell are moved by hand to the marking, degreasing, spray-painting and packaging equipment.

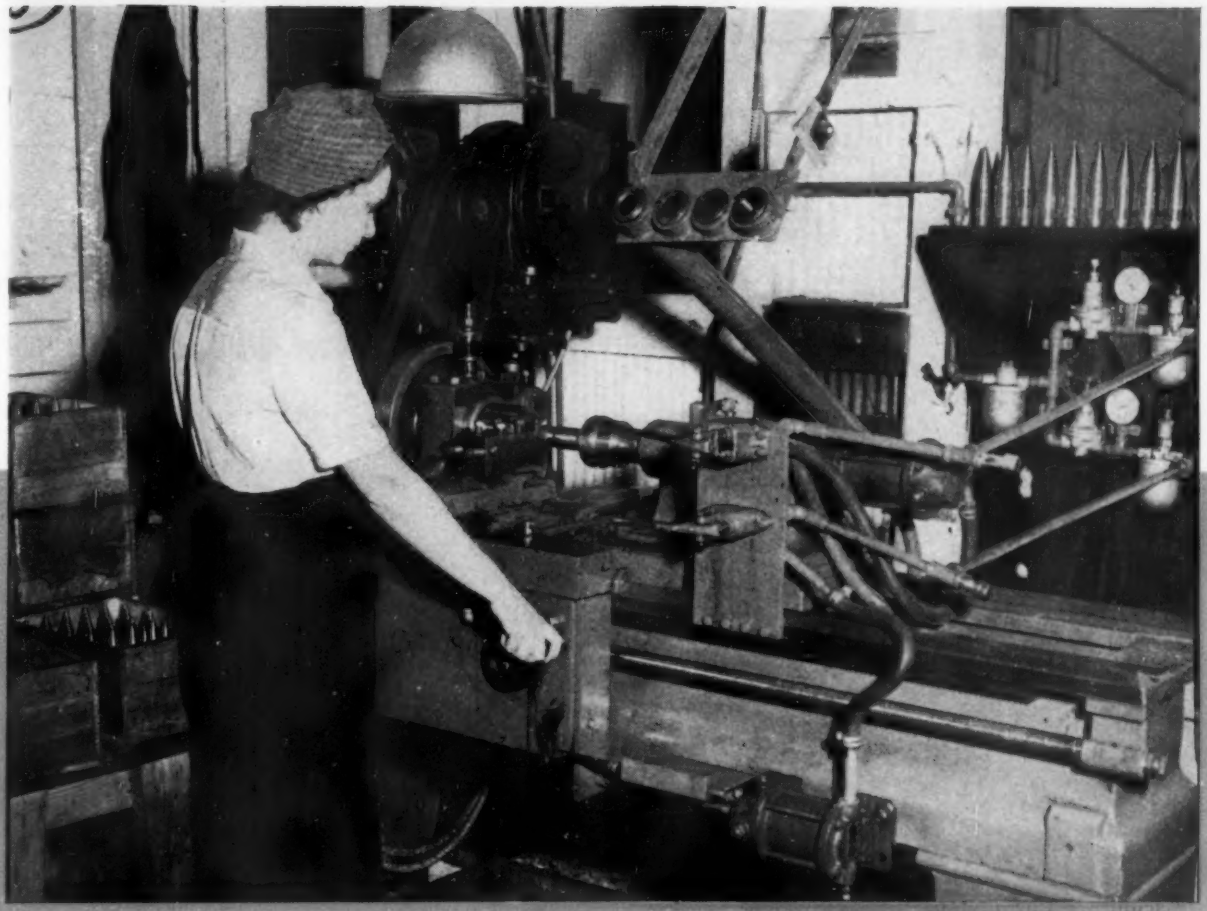
A 1⅝-in. capacity, eight-spindle Conomatic auto-





Steel shell bodies for the high-explosive 37-mm. shell are rough turned and bored in this 8-spindle Conomatic. The band groove is finish turned and knurled at the same time. Considerable success has been attained in training former automobile repair mechanics to set up and operate this machine

Two 6-in. diameter screw conveyors fitted in lengths of seamless steel pipe remove chips from the base of the Conomatic to a bin outside the building. Each conveyor section is driven by a Master ½-hp. gear motor at 36 r.p.m.



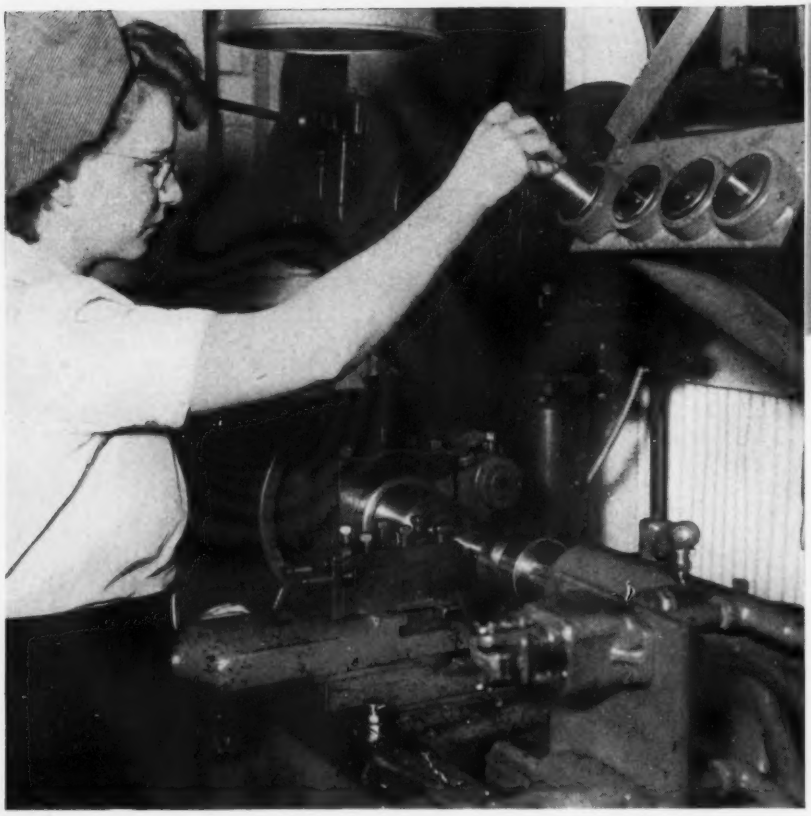
Bourrelet and rear band diameters are finish turned in this rebuilt engine lathe having air-operated tailstock and carriage return. The fixed tool block carries two ⅝-in. square tools tipped with Vascoloy-Ramet

matic bar stock machine operates on a 37-sec. cycle to rough turn and bore the projectile bodies, and finish form and knurl the band grooves. The 1½-in. diameter steel bars are turned at 127 ft. per min. cutting speed, with the machine geared to feed the turret tools at 0.012 in. per min. and the cross-slide tools at 0.004 in. per rev. High-speed steel tools of conventional design are employed for the operations performed by this machine, except that it has been found that grinding a 2½-deg. shear angle, or side rake angle, on the large forming tool which rough turns the long ogive of the shell results in a better finish on the work and considerable increase in tool life. The addition of this shear angle also has been found to reduce back pressure on the work. Formerly the work was, from time to time, pushed back into the collet at this position. To further increase the productivity of this machine, larger coolant supply pipes were installed for each of the eight work stations. With the ½-in. diameter pipe nozzles now used it is possible to keep the work well flooded with the soluble oil cutting compound with much increase in tool life, and a considerable reduction of rejections due to poor surface finish.

When working continuously, one of these eight-spindle automatic screw machines produces many pounds of turnings in a day's time. In order to make light work of the chip removal problem, a screw-type chip conveyor was built into the bed of this machine shortly after it was installed. Now, the chips automatically are delivered to a scrap bin outside of the building without attention from anyone.

The chip conveyor consists of two lengths of helical screw conveyor; each section being fitted in a length of steel pipe salvaged from a nearby scrap yard. One of these units is supported longitudinally in the base of the machine. The pipe surrounding the screw conveyor of this unit is cut away on the top side at the point where the chips fall into the base from the cutting tools. At the other end of the pipe, the bottom side is cut away to permit the chips to fall into the loading end of the second conveyor section. Rotation of the screw inside of the pipe causes the chips to be moved out of the machine, while the coolant drains back into the machine base. Each of the 6-in. diameter conveyor sections is driven at 36 r.p.m. by a Master ½-hp. gear-head motor connected by chain and sprocket wheels to the center shaft of the screw conveyor.

The rough machined shell, as they come from the Conomatic, are finished in the band groove, but all other exterior and interior surfaces must be finish



Above the finish turning lathe are four ring gages mounted in a welded bracket. Shell passed through the last go gage drop through a pipe to a bench in front of the next machine

machined. The first of these operations consists of finish-turning the bourrelet and rear band diameters. In most shops these diameters would be finished in a centerless grinder, but the quantity of shell called for on our contract did not justify the purchase of one of these machines. Instead, we purchased an old 16-in. W. F. Davis cone-drive engine lathe from a used machinery dealer and rebuilt it for semi-automatic turning of these two diameters with single-point tipped tools.

In rebuilding this lathe, we first rebushed the spindle bearings and mounted a 3-hp., four-speed Western motor-driven transmission which is belted to the largest step of the cone pulley on the spindle. Although four spindle speeds now are available, we have found that speed of 1,050 r.p.m. is best suited for the work being done. The lathe carriage and cross-slide have been simplified. All of the gears and other parts have been removed from the apron, except the split nut and its actuating mechanism for connecting the carriage to the leadscrew. The cross-slide screw has been removed, and the cross-slide locked in position on the carriage. The leadscrew is driven by V-belt from the lathe spindle to feed the carriage at 0.008 in. per rev. of the spindle. Also, an adjustable stop has been mounted on the lathe bed to trip the split nut mechanism when the tools have reached the end of their cut. Alongside of this trip is mounted a single-acting Tomkins-Johnson air cylinder for returning the carriage to the starting position.

Mounted on the cross-slide is a special tool block carrying two Vascoloy - Ramet tipped tools which remove approximately 0.015 in. of stock from the shell diameters to finish the bourrelet diameter and the rear band diameter. The tools in the holder are spaced so that both cuts finish at approximately the same time and a carriage travel of only $1\frac{3}{4}$ in. is necessary. Cutting feed of the carriage is toward the tailstock.

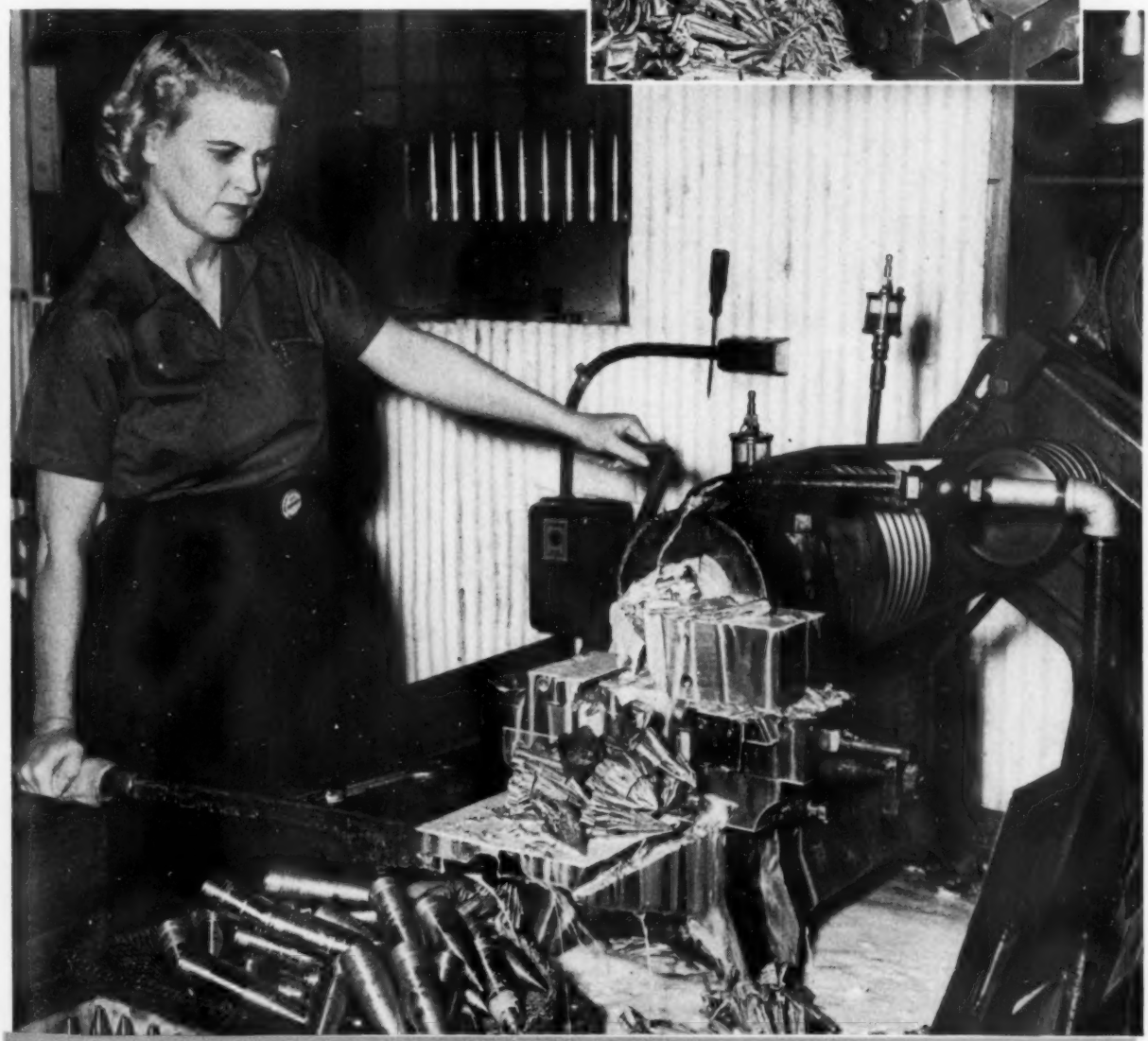
A double-acting Tomkins-Johnson air cylinder has been mounted at the rear end of the tailstock and connected to the tailstock spindle. A special ball bearing cone center having a cavity shaped to fit the rough-formed nose of the shell is mounted in the forward end of this spindle. In front of the tailstock is mounted a panel carrying two hand-operated air valves. The upper valve controls movement of the tailstock spindle, while the lower valve controls the cylinder which returns the carriage to its starting position after a cut has been completed. Mounted on the wall back of the lathe are the necessary air cleaners, oilers and pressure regulators for the two cylinders.

In performing her work, the operator of this lathe first places a rough turned shell over an air blast nozzle to blow dirt and chips out of the cavity. She then places the cavity end of the shell over the continuously rotating serrated male center in the headstock spindle and aligns the shell so that the nose end is in front of the tailstock center. Meanwhile, her right hand has been placed on the upper air control valve, so that as soon as the shell is in place the tailstock spindle is moved forward to hold the shell tightly against the center in the lathe spindle. Air pressure is maintained against the shell throughout the turning operation, so that it will not slip on this center.

The operator next closes the split nut to start the carriage feeding toward the tailstock. While one shell is being turned, the operator gages the diameters of a previously turned shell. When the carriage reaches

the end of its cut, feed is automatically tripped off, and the operator again actuates the upper air control valve to return the tailstock spindle to its original position. Just as soon as pressure is released she lifts the shell just turned away from the tools, and then drops her right hand onto the low air control valve to return the carriage to its starting position. The two tools, once set in position for turning the two diameters within the required size limit, are not moved on the cross-slide until wear makes resetting necessary.

Mounted in a bracket above the lathe are four ring gages for checking the two diameters just turned. The operator successively tries each shell in each of these



(Top) The heavy Rex MM toolsteel formed tool averages about 600 shell per grind. It is mounted at the back of the cross-slide to provide room for inserting shell in the machine collet

An old bar cut-off machine was salvaged from a junk yard to make this finish turning machine. The formed tool turns the ogive and the radius nose and holds the finished length of the shell. The coolant used drains off the finished shell readily and the shell need not be degreased before inspection

The first shop inspection on these shell comes immediately after the ogive turning operation. Length, weight and outside diameters are checked on every shell, and exterior surfaces are inspected visually for cracks and other defects

ring gages, moving the shell from right to left. In order of use these gages are: (1) not go on rear band diameter, (2) go on rear band diameter, (3) not go on bourrelet diameter, and (4) go on bourrelet diameter. Back of the fourth gage is a length of 2-in. diameter heavy-duty seamless steel pipe. If the shell passes through the last gage, it is released by the operator and slides through the pipe to the operator's position at the next machine, where the ogive is finished. This arrangement eliminates any need for stacking the shell in trays and trucking them to the next machine.

The machine used for form-turning the ogive and nose radius on these shell is an old bar cut-off machine salvaged from a junk yard and rebuilt for our purposes. The machine was overhauled to put the bearings and slides in good condition, and was motorized by mounting a four-speed Turner transmission with a 3-hp. driving motor at the back of the machine. Six V-belts connect the transmission to a sheave on the spindle of the machine. The draw-back collet in the spindle has been revised to grip the shell both on the rear band and the bourrelet diameters. The collet grips the shell on the rear band diameter first and then is forced down onto the bourrelet diameter, insuring accurate centering of the shell and providing a stronger support than if the collet gripped both diameters equally.

The heavy dove-tail type form tool is made of REX MM molybdenum tool steel and is shaped to shave the entire ogive and nose radius shape at the same time. The cutting face of the tool is ground at a slight angle, so that the form at the nose end of the shell is on center but is $\frac{1}{32}$ in. above center at the bourrelet end of the cut. This eliminates the chatter experienced when all of the cutting edge was on center, and insures a smooth cut. Room is provided for placing the shell in the collet and then removing it after the cut has been completed by placing the form tool at the back of the cross-slide and rotating the spindle in a clockwise direction.

The cross-slide is connected by three gears to an operating lever at the front of the machine. Two stops are provided, one at the back of the cross-slide, and one under the operating lever, so that the shell is turned to size when the lever has been brought down solidly and both stops have been contacted. The spindle rotates continuously at about 250 r.p.m., and is not stopped for loading and unloading the shell. The shell is located in the collet against a stop pin in the collet sleeve which locates against the base end to insure turning the shell to the proper length. Experience has shown that approximately 600 shell can be turned per tool grind when the coolant is made up by mixing one part of Whitfield-Richards Lubewell soluble oil with 20 parts of water. This same coolant is used in all of the machine tools in the shell department, including the Conomatic.

Following the nose-turning operation each shell is

inspected for length, weight, accuracy of band groove, and size of bourrelet and rear band diameters. Also, each shell is given a visual inspection under a large magnifying glass to locate any cracked or seamed shell. This inspection station insures against banding any defective shell. The weight of the shell must be held within plus or minus 0.02 lb.

Shell are passed from this inspection station to a West tire setting machine where copper bands are pressed into the band grooves. About 900 lb. per sq. in. pressure is applied, the machine being operated four times on each shell with the shell being rotated about 10 deg. between each pressure application.

Oster No. 601-WD hand turret lathes are used for finish reaming and tapping the cavity, counterboring and chamfering the base end, and turning the copper bands. The tooling set-up for these operations on one of these lathes is shown in an accompanying illustration. Four positions are used on the hexagon turret, while the band turning tools are mounted on the cross-slide carriage. The sequence of operations on one of these lathes is as follows:

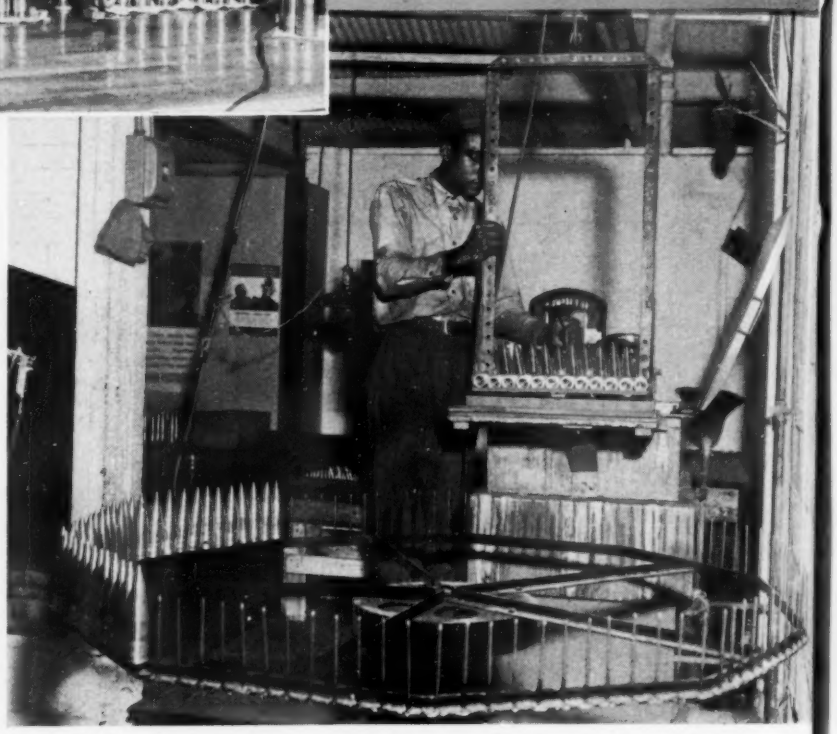
First, a rough shell is placed on a locating pin mounted in the first hexagon turret position. The turret slide is brought forward to locate the shell in the collet chuck and then the pin is removed from the shell by reversing the turret slide.

The hexagon turret is indexed to the next position, and the spindle speed is set at 123 r.p.m. The operator then feeds the turret forward by hand to contour ream the cavity and the minor diameter at the open end of the cavity which later is to be tapped. The tool used is a $1\frac{1}{16}$-in. bridge-type reamer ground to proper shape and size in the toolroom. A recently developed four-flute reamer made in the toolroom is expected to give better cutting efficiency for this operation.

Next, the hexagon turret is indexed to bring a solid tap carried in a Warner & Swasey safety tap holder into line for tapping the fuze seat. Spindle speed remains at 123 r.p.m. for tapping the 1.020-in. 18NS-3

Shell cavities are finished and tapped, and copper rotating bands are turned in Oster hand turret lathes. By tapping during this operation, the concentricity of exterior and interior surfaces with the tapped threads is insured. When in operation, coolant is flooded over the work at all times

Girls check every exterior and interior dimension at the final inspection bench. To speed up these operations, gages are mounted in blocks on the bench in convenient positions for the inspectors



Degreased shell are lifted by hand in lots of twelve to a cooling rack near the paint spray booth

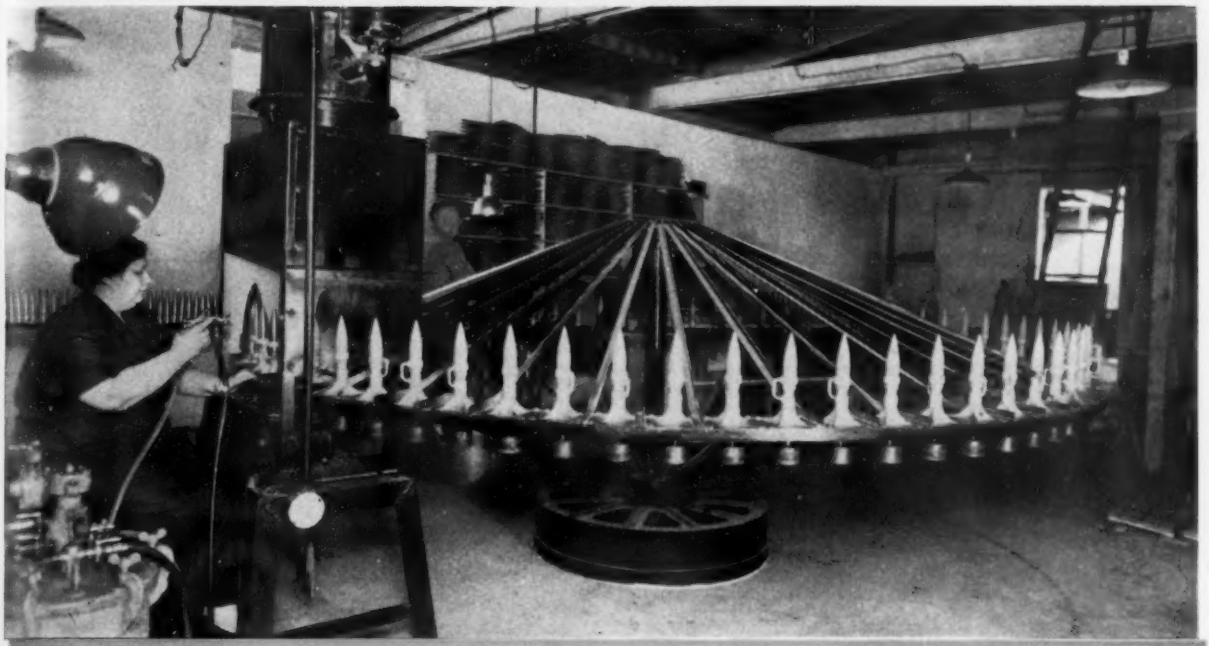
left-hand thread to a minimum depth of 0.55 in. and a maximum depth of 0.70 in. When the tap has been withdrawn by reversing the spindle rotation, the turret is backed out of the way and the band is turned with the formed tools on the cross-slide. By doing the band-turning operations after tapping, but before counterboring the base of the shell, time is given for the flood of coolant to wash chips out of the shell cavity before the counterbore pilot is inserted. For band turning, spindle speed is set at 286 r.p.m. and the formed tool in the front block on the cross-slide is used to rough form the band shape and face each end of the band down to the steel shell body. Next, the skiving tool on the rear of the cross-slide finish forms the band.

Final machining operations in the Oster turret lathe consist of counterboring and chamfering the base of the shell, using the hexagon turret. Two high-speed steel bits are carried in a special tool block for this operation. The chamfering tool removes the burrs at the start of the tapped threads, while the counterboring tool cuts a recess for the base fuze. The tool block has a ball bearing roller which serves as a positive stop to insure correct depth of counterboring, and also carries a pilot extension 0.002 in. larger than the minor diameter of the threads previously tapped. The roller which serves as a depth stop also turns under the burr formed by the counterboring tool.

All shell next go to the final inspection bench for a 100 percent check of all dimensions. First, a Rickert-Shafer friction-drive bench tapping machine with a 1.020-in.-18 left-hand tap is used for cleaning the burrs out of the threads in the base of the shell. Then chips are blown out of the cavity by holding the shell over an air jet. A second Rickert-Shafer friction-drive tapping machine carrying a go thread gage is used to check the thread to insure that a fuze can be assembled into the shell later.

As the shell then are passed down the inspection bench, the length is checked with a go and not go height gage fixed to the bench. Weight is checked on a Toledo Speedweigh comparator and must be within plus or minus 0.02 in. lb. of the allowed weight. A series of go and not go snap gages mounted in blocks on the top of the inspection bench next are used for checking all external diameters, while go and not go plug and plug thread gages are used to check all internal diameters. Finally, each shell is inspected under an illuminated magnifying glass for defects.

Shell that pass this group of shop inspectors are



A 12-ft. diameter carrier was developed for passing the shell through the paint spray booth and transferring them to a second painting unit where the cavities are sprayed with acid-proof black paint. The large diameter was necessary to permit the painted shell to dry before removal from the vertical spindles

moved down the inspection bench to a government inspection position where all dimensions are checked, and a special gage is used to check the concentricity of the rotating band, rear band and cavity with the bourrelet diameter. The gage holds the shell horizontally between a series of three pairs of rollers contacting the shell on the bourrelet. Dial indicators then show any eccentricity as the shell is rotated by hand.

Accepted shell are moved down the bench to a marking machine where identifying data is stenciled on the rotating band. Built in our toolroom, this small machine is arranged so the marking wheel is rotated continuously and a cam forces rollers against the shell to hold the band against the wheel for one revolution. Marked shell are cleaned in a Detrex dip-type degreaser having a special rack holding twelve shell bodies on each side. A total of 24 shell are cleaned each time the rack is lowered into the dip tank. The operator of the marking machine also takes care of the degreasing unit and transfers cleaned shell from the degreaser racks to a rotating rack beside the paint spray machine. This rack has five flat sides around its circumference, each side having twelve vertical pins to which loads of twelve shell are transferred by a hand rack from the degreaser racks. This holding rack insures that the shell do not come in contact with any dirt or grease before they are painted.

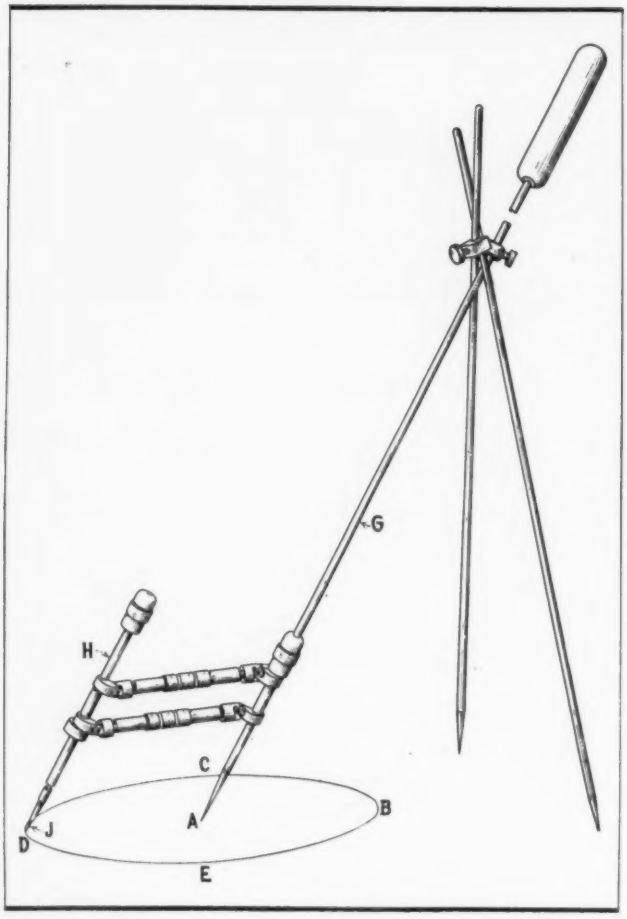
Each shell is sprayed on the exterior surfaces with yellow lacquer and on the interior surfaces, except the threaded portion, with black acid-proof ammunition paint. For these operations, a special merry-go-round carrier has been developed and built in our shop. The wheel of this carrier is 12 ft. in diameter and has 72 spindles set vertically around its circumference. Each spindle is supported in bronze bearings and has a wheel on its bottom end for contacting a belt under the spray paint booth to rotate the shell while they are being sprayed. The drive for this belt consists of a $\frac{1}{4}$-hp. Master gear motor driving a single V-belt which rotates each shell at 125 r.p.m. Two spindles are rotated at a time, and the pull of the belt against the spindle pulleys causes the entire carrier to rotate slowly. By placing her hand on the carrier, the spray paint operator can hold back the carrier until a shell has been completely coated. The spindles which hold the shell have shields which cover the copper rotating bands on each shell, so that no paint is applied to these bands. The hood over the spray position has an exhaust fan in the stack.

About 250 deg. around the carrier from the spray-painting position, dried shell are removed by the operator of a spray-painting unit where the interior of the cavities are coated. This unit consist of an angle iron frame supporting a DeVilbiss spray gun in a vertical fixed position, and with a fixed shield above the gun so that the paint does not coat the threads or the exterior of the shell. The gun is operated by a pedal when a shell is held by hand over the shield.

War Winning SUGGESTIONS

The following ideas were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to its war production.

Compass Draws Ellipses Quickly



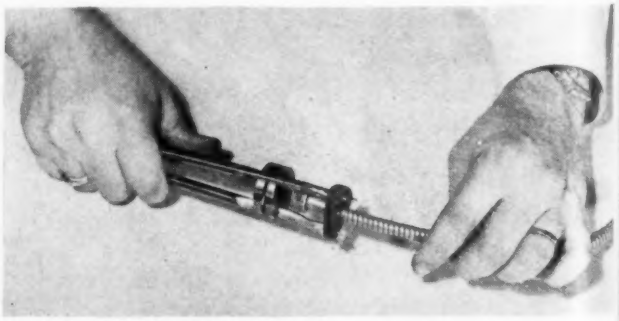
The instrument shown in the drawing will scribe an ellipse with the ease and accuracy of a compass scribing a circle. It was designed to layout intersections between cylindrical objects, between planes and cylindrical objects, and between cylindrical objects and the intersections of a plane with warped surfaces, plane with curved surfaces, and a warped plane with curved surfaces. Such problems are found in sheet-metal, pipe-fitting and ship-fitting layout where cylindrical shapes are used.

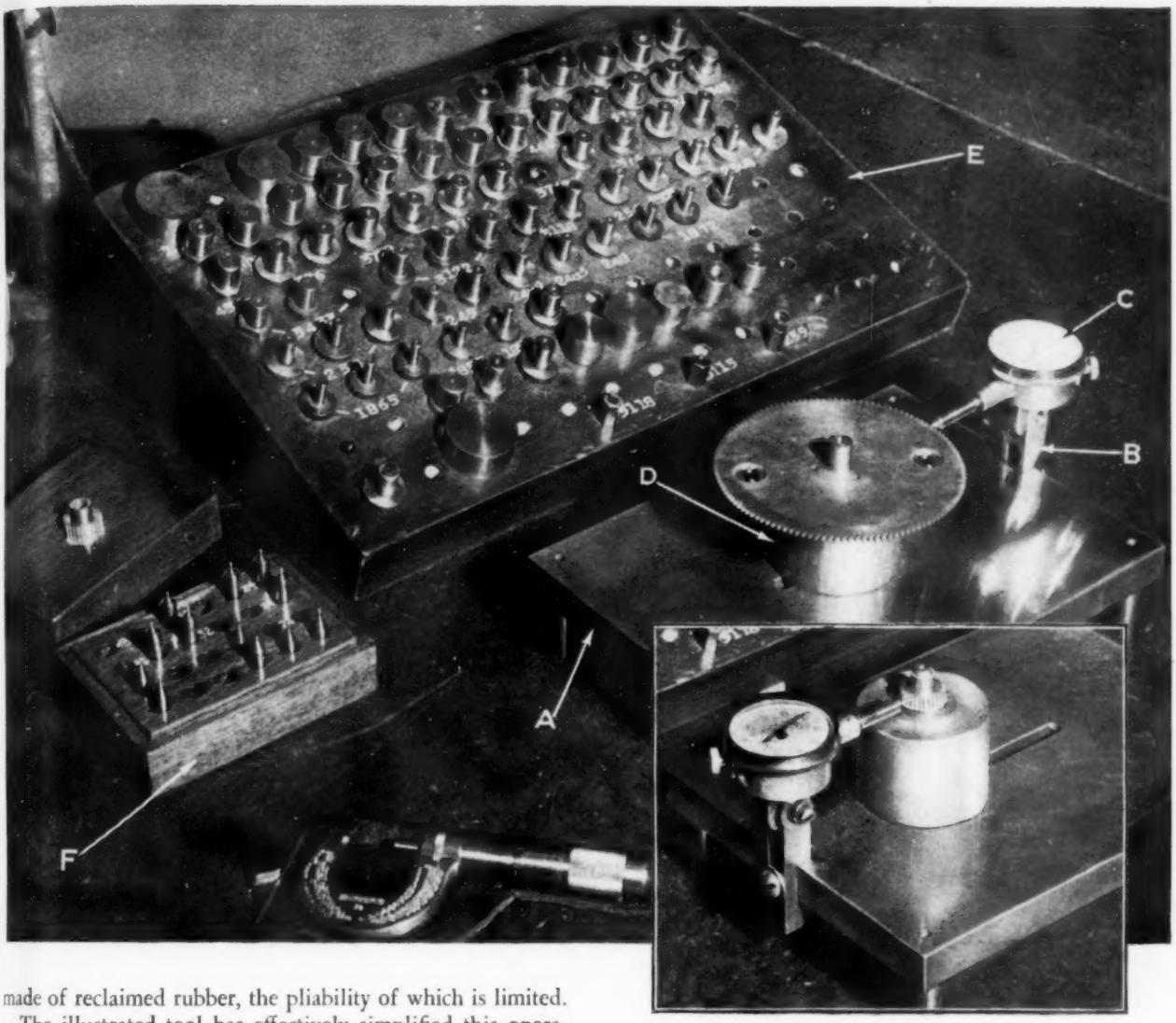
The elliptical compass gives an accurate layout of the above mentioned intersections since the tracing point follows the imaginary surface of a cylinder and at the same time is in contact with the intersecting surface. The instrument can be used to draw ellipses on plane surfaces.

To scribe an ellipse *BCDE*, place the point of rod *G* at *A*, and set arm *H* with marker to radius *AC* or one-half the desired minor axis. Locate points *B* and *D* on the major axis with a prick punch, and begin scribing from *B* to *D*. The arm holding the marker will travel downward along rod *G* as the marker passes from *B* to *D*, and upwards from *D* to *B*. Unless the surface being marked is very smooth, it will be better to scribe one-half of the ellipse from *B* to *C* to *D*, and then return to *B* and scribe *B* to *E* to *D*. In this manner all scribing is done on the downward movement of the arm holding the marker. *Suggested by Alfred H. Anderson, Chickasaw Ordnance Works.*

Tool Spreads Rubber Insulators

Rubber grommets are used to insulate electrical cables from metal panels through which the cables pass. The cables are received from the manufacturer with couplings or fittings at each end. Because the grommets are used on electrical equipment, they cannot be split to simplify their installation; therefore, they are usually forced over the fittings with the fingers and a screwdriver or pointed instrument. This places a strain on the grommet, and has a tendency to weaken or tear the rubber. Frequently an operator will slip and jab the pointed instrument into his hand. With the hiring of women for this operation, the problem became more acute; furthermore, the task became more difficult when rubber grommets were replaced by those





made of reclaimed rubber, the pliability of which is limited.

The illustrated tool has effectively simplified this operation. The three tips of the tool are brought together by spreading the handles with the fingers. The grommet is placed around the tips, which are then expanded by squeezing the handles together, stretching the grommet in three directions, thus equalizing momentary distortion. The fitting is slipped through the enlarged grommet, and pressure on the handles released, permitting the grommet to slip off of the tips, assume its normal size, and embrace the cable. When the constricting pressure of the grommet has thus been relieved, the tool collapses and is easily withdrawn. Installation time per grommet is 0.2 min., which compares with 2 to 7 min. formerly required. *Suggested by A. Speraneo, Curtiss-Wright Corporation.*

Gear Inspection Increased 500 Percent—Eliminates Wire Method

When checking gears for accuracy, it has been necessary in the past to use the method of wires and micrometers. Realizing that this method was slow and cumbersome, the illustrated fixture was designed whereby it is possible for a man to check in one setting any quantity of any one size of gear for the following: (1) run-out of pitch diameter, (2) concentricity of bore with pitch diameter, (3) size of gear bore, (4) faulty teeth, and (5) excessive burrs.

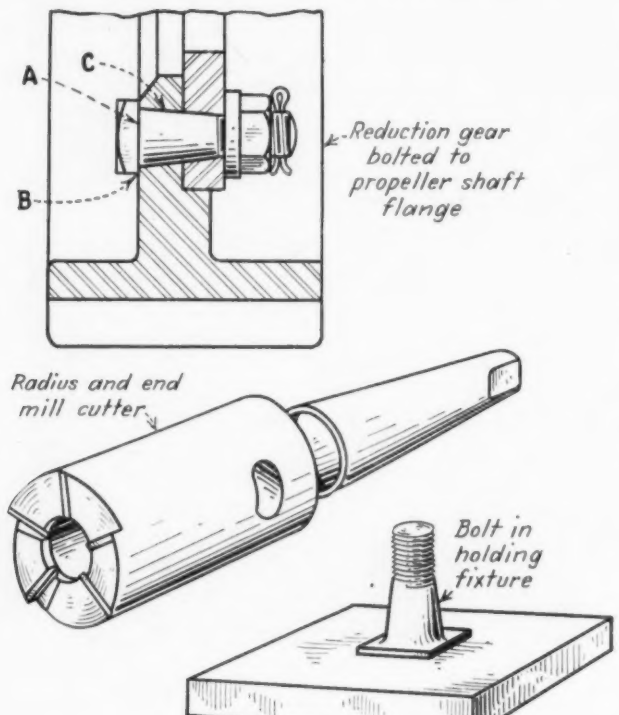
The fixture consists of a square mounting plate *A* of cold-rolled steel with a central slot $2\frac{1}{2}$ in. long and $\frac{1}{4}$ in. wide. Affixed to the end of this plate and keyed into position by a screw and washer is a slotted mounting post *B* for a dial indicator *C*. This indicator is mounted in a horizontal position and parallel to the plate in such a manner that the measuring arm of the indicator is aligned with the slot in the mounting plate. A bushing *D*, a set of hardened studs *E* whose sizes corresponds with gear bores for the purpose of positioning the gears to be checked, and a set of hardened balls *F* whose sizes correspond with wire diameters complete the equipment used.

The following procedure is used in checking a gear: The pitch diameter of the gear is determined, using the micrometer and wire system. One-half of this measurement less one wire diameter is determined and that distance is set up between the adjustable stud and the ball on the indicator arm by means of Johansson blocks. Adjustment screws are tightened, the indicator set at zero. The fixture

is then ready for operation. Gears are placed, one at a time, on the hardened stud and checked by means of the indicator.

It is obvious that the diameter of the hardened stud must be within the tolerance limit of the bore of the gear being measured. This set-up has proved to be satisfactory, saving considerable man-hours and increasing production approximately 500 percent. *Suggested by Joseph Lob, RCA Victory Division, Radio Corporation of America.*

Salvage of Reduction-Gear Bolts



Bolts that hold the reduction gear to the propeller-shaft flange on one type airplane engine take the entire torque of the engine. It is obvious from the drawing that these bolts must be fitted carefully; otherwise, they may sheer and cause a complete engine failure. Important points of the assembly are the trueness of face *A*, the radius *B*, the taper of shank *C*, and a perfect blending of these three surfaces. The fit of the bolts in the flange holes on the gear and propeller shaft is also important.

Salvage operations on this bolt were performed formerly on an engine lathe with the bolt held in a split collet of aluminum. It was necessary for the jaws of the collet to grip the bolt on the tapered portion of the shank; consequently, they had to be made of a soft material. This in turn prevented the use of a form tool, and made blending and truing operations difficult with an ordinary toolbit.

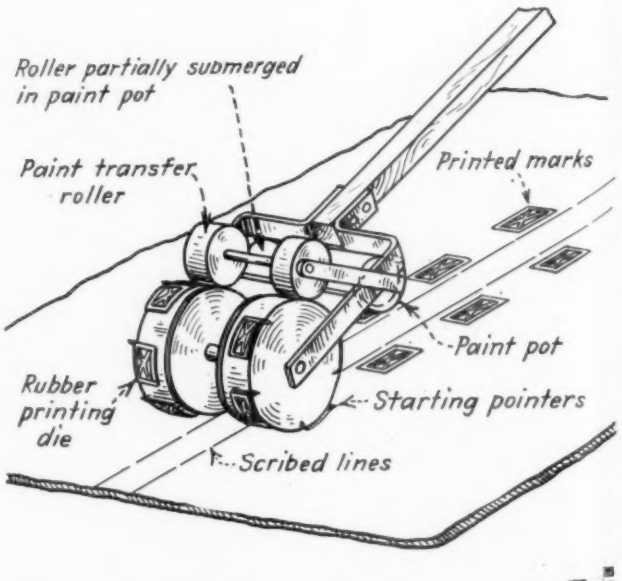
The tool now used for salvaging these bolts is similar in design to a hollow and mill and is used with a drill press and a plate holder. Specifications call for the upper and lower faces of the bolt head to be parallel and perpendicular to the center line of the shank, thus permitting the location of the part from the upper surface. These specifications are met by using the hollow end mill shown in the drawing.

The bolt is inserted head down in the plate holder, the hole in which allows a side clearance of 0.025 in. on each side of the square head, and permits alignment of the bolt with the cutter. The cutting edges of the tool are so formed that surfaces *A*, *B* and *C* are machined simultaneously. If metal is removed from surface *A*, surface *B* retains the same taper. The adoption of this tool released one engine lathe for other work in the plant, machining time was reduced considerably, and the finish now obtained eliminates frequent reworking of the bolt. *Suggested by Maxwell Hamilton, Aircraft Engine Division, Packard Motor Car Company.*

Marker Locates Stagger Welds

When sight guided along scribed lines, the device shown in the drawing will print marks on a plate which are uniformly spaced to indicate the positions of stagger welds for securing stiffeners or other beams to the plate. For daylight welding the marks are produced with white or aluminum paint easily visible through the welders' lens, obviating the need for him to raise his hood to ascertain where one weld stops and the next one begins. At night, fluorescent paint can be used since it glows under the ultra-violet light from an electric arc.

This device speeds up the marking of stagger welds and cuts down the extension of welds beyond the necessary



length by the inability of the welder to see the marks clearly. With the old method of marking, from 5 to 7 min. was required per 20 ft. of plate. This machine marks the plate at a rate of 5 sec. per 20 ft. *Suggested by Guy H. Moorehouse, Permanente Metals Corporation.*

TIME-DATA SHEET NO. 46

Radial Drill Press Operations—XI

Operation Symbol	Description of Operation	Allowed Time Std. Hours
	(Continued from Time-Data Sheet No. 45)	
E_5	Turn over very large jig by jib crane	0.0420
F_5	Turn up trunnion jig one-half turn (90 deg.)	0.0400
G_5	Turn trunnion jig completely over (180 deg.)	0.0184
H_5	Open lid on jig or fixture (hinged lid)	0.0005
J_5	Remove lid from very large jig or fixture, using jib crane	0.0352
K_5	Open conjunction part of jig	0.0176
L_5	Wipe off fit on casting for plate jig	0.0045
M_5	Place plate jig on part	0.0219
N_5	Clamp plate jig to part, using two clamps, and recheck with center line	0.0200
P_5	Locate and spot in plate jig (per hole) 17/32 in. diameter drill	0.0041
Q_5	Remove plate jig and clamps from part	0.0099
R_5	Put on and remove cover of jig when not hinged	0.0029
S_5	Release locating screw by hand	0.0009
T_5	Release locating screw with wrench	0.0018
U_5	Release thumb screw or wing nut	0.0005
V_5	Tighten and release hexagon or square nut with open end wrench	0.0034
W_5	Remove and lay aside small part (0.51 to 5.00 lb.) from jig	0.0015
X_5	Remove and lay aside medium part (5.01 to 20.00 lb.) from jig	0.0029
Y_5	Remove and lay aside large part (20.01 to 45.00 lb.) from jig	0.0044
Z_5	Remove and lay aside very large part (45.01 to 75.00 lb.) from jig	0.0064
A_5	Remove and lay aside very large part (75.01 to 2,000 lb.) from jig with jib crane	0.0270
B_5	Remove and lay aside very large part (over 2,000 lb.) from jig with over-head crane	0.0165
D_5	Place and remove locating pin from jig or fixture	0.0046
	Each Piece Operations	
	(Applicable to parts held in vise.)	
C_6	Clean vise	0.0020
D_6	Place small part (0.51 to 5.00 lb.) in vise	0.0015
E_6	Place medium part (5.01 to 20.00 lb.) in vise	0.0029
F_6	Place large part (20.01 to 45.00 lb.) in vise	0.0044
G_6	Line up part in vise with scale or level	0.0040
H_6	Tighten vise with mallet	0.0019
J_6	Hammer part	0.0012
K_6	Release vise	0.0012
L_6	Turn small part (0.51 to 5.00 lb.) in vise	0.0015
M_6	Turn medium part (5.01 to 20.00 lb.) in vise	0.0024
N_6	Turn large part (20.01 to 45.00 lb.) in vise	0.0038
P_6	Remove small part (0.51 to 5.00 lb.) from vise	0.0011
Q_6	Remove medium part (5.01 to 20.00 lb.) from vise	0.0022
R_6	Remove large part (20.01 to 45.00 lb.) from vise	0.0036

(Continued on Time-Data Sheet No. 47)

Table No. 11—Time To Tap Brass and Aluminum Alloys

Tap Size	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
Thds. per In.	20	16	13	10	8	7	6	5	4 1/2	4 1/2	4	4	3 1/2
R.P.M.	688	458	344	229	172	138	107	91	80	72	63	58	53
Depth Tapped	Allowed time in decimal hours (includes lead of tap)												
1/8	0.0007	0.0008	0.0009	0.0011	0.0013	0.0014	0.0017	0.0019	0.0021	0.0023	0.0025	0.0027	0.0029
1/4	0.0009	0.0010	0.0011	0.0013	0.0015	0.0018	0.0020	0.0022	0.0024	0.0026	0.0028	0.0030	0.0032
3/8	0.0010	0.0011	0.0013	0.0015	0.0018	0.0020	0.0022	0.0024	0.0027	0.0029	0.0031	0.0034	0.0035
1/2	0.0011	0.0013	0.0014	0.0018	0.0020	0.0023	0.0025	0.0027	0.0030	0.0032	0.0034	0.0037	0.0038
5/8	0.0013	0.0015	0.0016	0.0020	0.0022	0.0024	0.0028	0.0030	0.0032	0.0035	0.0037	0.0040	0.0041
3/4	0.0014	0.0016	0.0018	0.0022	0.0025	0.0028	0.0030	0.0032	0.0035	0.0038	0.0040	0.0043	0.0044
7/8	0.0015	0.0018	0.0019	0.0024	0.0027	0.0030	0.0033	0.0035	0.0038	0.0041	0.0043	0.0047	0.0047
1	0.0017	0.0020	0.0021	0.0026	0.0029	0.0033	0.0036	0.0038	0.0041	0.0044	0.0046	0.0050	0.0051
1 1/8	0.0018	0.0021	0.0023	0.0028	0.0031	0.0035	0.0038	0.0040	0.0043	0.0047	0.0049	0.0053	0.0054
1 1/4	0.0020	0.0023	0.0025	0.0030	0.0034	0.0038	0.0041	0.0043	0.0046	0.0050	0.0052	0.0056	0.0057
1 3/8	0.0021	0.0024	0.0027	0.0033	0.0036	0.0040	0.0044	0.0046	0.0045	0.0053	0.0055	0.0060	0.0060
1 1/2	0.0022	0.0026	0.0028	0.0035	0.0038	0.0043	0.0046	0.0048	0.0052	0.0056	0.0058	0.0063	0.0063
1 3/4	0.0025	0.0029	0.0032	0.0039	0.0042	0.0048	0.0051	0.0053	0.0057	0.0062	0.0064	0.0069	0.0069
2	0.0028	0.0033	0.0035	0.0043	0.0047	0.0053	0.0057	0.0059	0.0063	0.0068	0.0070	0.0076	0.0076
2 1/4	.....	.....	0.0039	0.0047	0.0051	0.0058	0.0062	0.0064	0.0068	0.0074	0.0076	0.0082	0.0082
2 1/2	.....	.....	0.0042	0.0052	0.0056	0.0063	0.0067	0.0069	0.0074	0.0080	0.0082	0.0088	0.0088
2 3/4	.....	.....	.....	0.0056	0.0060	0.0068	0.0072	0.0074	0.0079	0.0086	0.0088	0.0094	0.0094
3	.....	.....	.....	0.0060	0.0065	0.0073	0.0078	0.0080	0.0085	0.0092	0.0094	0.0102	0.0101
3 1/4	.....	.....	.....	.....	.....	0.0078	0.0083	0.0084	0.0090	0.0098	0.0100	0.0108	0.0107
3 1/2	.....	.....	.....	.....	.....	0.0083	0.0088	0.0090	0.0096	0.0104	0.0106	0.0114	0.0113
3 3/4	.....	.....	.....	.....	.....	.....	.....	.....	0.0101	0.0110	0.0112	0.0121	0.0119
4	.....	.....	.....	.....	.....	.....	.....	.....	0.0107	0.0116	0.0118	0.0127	0.0128
4 1/4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0134	0.0132
4 1/2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0140	0.0138
4 3/4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0148	0.0144
5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0154	0.0150
Per Inch	0.0011	0.0013	0.0014	0.0017	0.0018	0.0020	0.0021	0.0021	0.0022	0.0024	0.0024	0.0026	0.0025

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HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES

TIME-DATA SHEET NO. 47

Radial Drill Press Operations—XII

Operation Symbol	Description of Operation	Allowed Time Std. Hours
	(Continued from Time-Data Sheet No. 46)	
	Each Piece Operations	
	(Applicable to parts held on table.)	
S_6	Clean table, brush or blow off chips	0.0030
T_6	Place small part (0.51 to 5.00 lb.) on table	0.0015
U_6	Place medium part (5.01 to 20.00 lb.) on table	0.0029
V_6	Place large part (20.01 to 45.00 lb.) on table	0.0044
W_6	Place very large part (45.01 to 75.00 lb.) on table by hand	0.0064
X_6	Place very large part (75.01 to 2,000 lb.) on table with jib crane	0.0352
Y_6	Place very large part (over 2,000 lb.) on table with over-head crane	0.0450
Z_6	Line up small part with surface gage	0.0090
A_7	Line up medium part with surface gage	0.0150
B_7	Line up large part with surface gage	0.0310
C_7	Line up small part with square	0.0060
D_7	Line up medium part with square	0.0120
E_7	Line up large part with square	0.0290
F_7	Line up small part with level	0.0110
G_7	Line up medium part with level	0.0200
H_7	Line up large part with level	0.0350
J_7	Shim part	0.0081
K_7	Set jack, per jack	0.0021
L_7	Set and tighten clamp — already in place	0.0035
M_7	Release and move clamp aside — clamp already in place	0.0024
N_7	Place clamp, set and tighten — clamp placed and removed complete	0.0076
P_7	Release and remove clamp — clamp placed and removed complete	0.0040
Q_7	Turn over small part (0.51 to 5.00 lb.)	0.0010
R_7	Turn over medium part (5.01 to 20.00 lb.)	0.0019
S_7	Turn over large part (20.01 to 45.00 lb.)	0.0031
T_7	Turn over very large part (45.01 to 75.00 lb.) by hand	0.0044
U_7	Turn over very large part (75.01 to 2,000 lb.) with jib crane	0.0490
V_7	Turn over very large part (over 2,000 lb.) with over-head crane	0.0450
W_7	Wait on over-head crane	0.0451
X_7	Remove small part (0.51 to 5.00 lb.) from table	0.0011
Y_7	Remove 5 to 20-lb. part from table	0.0022
Z_7	Remove 20 to 45-lb. part from table	0.0036
A_8	Remove 45 to 75-lb. part from table	0.0053
B_8	Remove very large part (75.01 to 2,000 lb.) from table with jib crane	0.0270
C_8	Remove very large part (over 2,000 lb.) from table with over-head crane	0.0165
D_8	Move arm from hole to hole, raise and lower spindle, engage feed (large parts)	0.0040

(To be continued)

Note: All values given in the above table include 15 percent allowance for personal necessities and fatigue.

Table No. 12—Time To Tap Cast Iron

Tap Size	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
Thds. per In.	20	16	13	10	8	7	5	5	4 1/2	4 1/2	4	4	3 1/2
R.P.M.	650	390	292	191	147	117	92	78	68	61	55	50	46
Depth Tapped	Allowed time in decimal hours (includes lead of tap)												
1/8	0.0007	0.0009	0.0010	0.0013	0.0015	0.0017	0.0019	0.0022	0.0024	0.0026	0.0029	0.0031	0.0031
1/4	0.0009	0.0011	0.0012	0.0015	0.0017	0.0020	0.0021	0.0025	0.0027	0.0030	0.0032	0.0035	0.0036
3/8	0.0011	0.0013	0.0015	0.0018	0.0020	0.0023	0.0024	0.0029	0.0030	0.0033	0.0036	0.0039	0.0040
1/2	0.0012	0.0015	0.0017	0.0020	0.0023	0.0026	0.0027	0.0032	0.0033	0.0037	0.0039	0.0043	0.0044
5/8	0.0014	0.0017	0.0019	0.0023	0.0025	0.0028	0.0030	0.0035	0.0036	0.0040	0.0043	0.0047	0.0047
3/4	0.0015	0.0019	0.0021	0.0025	0.0028	0.0031	0.0033	0.0038	0.0040	0.0044	0.0046	0.0051	0.0051
7/8	0.0017	0.0021	0.0023	0.0028	0.0030	0.0034	0.0036	0.0041	0.0043	0.0047	0.0050	0.0055	0.0054
1	0.0018	0.0023	0.0025	0.0030	0.0033	0.0037	0.0039	0.0044	0.0046	0.0051	0.0053	0.0058	0.0058
1 1/8	0.0020	0.0025	0.0027	0.0033	0.0036	0.0040	0.0042	0.0047	0.0049	0.0054	0.0057	0.0062	0.0062
1 1/4	0.0021	0.0027	0.0030	0.0035	0.0038	0.0043	0.0044	0.0050	0.0052	0.0058	0.0060	0.0066	0.0065
1 3/8	0.0023	0.0029	0.0032	0.0038	0.0041	0.0045	0.0047	0.0054	0.0055	0.0061	0.0064	0.0070	0.0069
1 1/2	0.0024	0.0031	0.0034	0.0040	0.0044	0.0048	0.0050	0.0057	0.0058	0.0065	0.0067	0.0074	0.0073
1 3/4	0.0027	0.0035	0.0038	0.0045	0.0049	0.0054	0.0056	0.0063	0.0065	0.0072	0.0074	0.0082	0.0080
2	0.0030	0.0039	0.0042	0.0050	0.0054	0.0060	0.0062	0.0069	0.0071	0.0079	0.0081	0.0089	0.0087
2 1/4	.....	.....	0.0046	0.0055	0.0059	0.0066	0.0067	0.0075	0.0077	0.0086	0.0088	0.0097	0.0094
2 1/2	.....	.....	0.0051	0.0060	0.0065	0.0071	0.0073	0.0082	0.0083	0.0093	0.0095	0.0105	0.0102
2 3/4	.....	.....	.....	0.0065	0.0070	0.0077	0.0079	0.0088	0.0090	0.0100	0.0102	0.0112	0.0109
3	.....	.....	.....	0.0070	0.0075	0.0083	0.0085	0.0094	0.0096	0.0107	0.0109	0.0120	0.0116
3 1/4	.....	.....	.....	.....	.....	0.0089	0.0090	0.0100	0.0102	0.0114	0.0116	0.0128	0.0123
3 1/2	.....	.....	.....	.....	.....	0.0094	0.0096	0.0106	0.0108	0.0121	0.0123	0.0136	0.0130
3 3/4	.....	.....	.....	.....	.....	.....	.....	.....	0.0114	0.0128	0.0130	0.0144	0.0137
4	.....	.....	.....	.....	.....	.....	.....	.....	0.0121	0.0135	0.0137	0.0151	0.0148
4 1/4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0159	0.0152
4 1/2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0167	0.0159
4 3/4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0174	0.0166
5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0178	0.0174
Per Inch	0.0012	0.0016	0.0017	0.0020	0.0021	0.0023	0.0023	0.0025	0.0025	0.0028	0.0028	0.0031	0.0029

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To Encourage Risk

WHEN PRESSURE GROUPS are avidly pursuing their own selfish ends, oblivious to the disastrous effects upon the country as a whole, a document issued last week by the business, labor and agriculture committees of the National Planning Association provides a tonic for everyone genuinely interested in America's future.

This document sets forth the thesis that the first goal of post-war planning should be a foundation for better living through provision for *enough jobs and lasting jobs.*

It says that "the basis of America's post-war economy should be private enterprise, with private business and industry and agriculture continuing to operate as the people's primary means for providing goods and services."

But, declares this forthright document, the private enterprise system must adjust itself to a changing world. Before there can be blueprints there must be unity of purpose among all groups, with realization that our group-interests are identical. If the private enterprise system is to go forward, there must be a new sense of responsibility for the welfare of all the people.

None of America's economic groups is self-sufficient, continues the joint statement. We are dependent upon each other.

The terms "Business" and "Labor" and "Agriculture" lose their capital letters and become "We, the People" when we realize that all the millions of us are *consumers* — each other's customers; that there cannot be full and continuing employment unless more people have the means to buy more of the products of our collective brains and hands and invested savings.

All of us, reads the document, agree that *there must be adequate incentive to encourage risk and responsibility; otherwise dollars saved will not be dollars dared for backing new possibilities for new jobs opened by new ideas, nor will the new ideas themselves be forthcoming.*

Since unemployment among those who want to work cannot be completely abolished, declares the document, we believe that a national security program is both necessary and desirable and that nutrition, education, vocational guidance and other phases of public well-being are matters of concern to all the groups to which we belong.

Post-war planning should start at home, but we should be blind to exclude the world. If we are to have full and continuing employment here, we must make customers of the people of other nations and be prepared to be their customers as well.

The rehabilitation of war-torn areas, the development of backward countries and a fair share of protective policing are in our own selfish interest.

"We must make certain," concludes the document, "that we and our children and their children won't have to go through still a third and more terrible war."

Here is a document to which few can take exception. It points the way toward the kind of a world and the kind of an economy which preserves the best in the American system and at the same time keeps pace with progress.

We commend it to the attention of Congress and to the executive branch of our government. We hope Mr. Morgenthau and the other taxing authorities will study it. It should be required reading for government renegotiators.

Surely they cannot miss the heart of it. Say the business, labor and agriculture committees of this association in one voice, "There must be adequate incentive to encourage risk and responsibility."

Let us not so legislate today that we destroy the seed money with which to plant tomorrow's crops.

Burnham Finney

GAGING BUSINESS

As tool orders decline, indications are that some builders will convert to parts subcontracting. Investigation by services of requirements and of supply of tools available is expected further to cut orders. Price squeeze is feared

Tool Orders Continue Drop The volume of machine tool orders flowing into the industry has been steadily declining. There is no indication, moreover, of a halt in the downward trend, which will result in a relatively speedy shrinkage in the backlogs of machine tool builders.

In the first quarter of 1943 the rate of new orders was about half of that during last summer and was only one-sixth of the total in March, 1942. Some companies, particularly those making special single-purpose tools, may go through the entire war operating at full capacity, but many of the more important builders are headed for a program calling for manufacture of products other than machine tools.

Some Builders As Parts Makers These builders are not likely to be asked to make products on a mass production basis as primary contractors, but instead to turn out vital parts for airplanes and other weapons. The government will utilize in this way the unusual skill of machine tool companies in doing precision work. It is the intention of war production officials to keep the machine tool industry fully occupied as long as the war lasts. This program obviously will supplement the main-line job of machine tool builders in continuing to make machine tools.

We've Nearly Finished Tooling The reason for this turn of events is that American industry is far along toward completion of its task of tooling up for war production. The machine tool industry has produced tools at such a prodigious rate the last four years that at the end of 1943 machine tools in service will be worth four billion dollars, after allowances for depreciation. This compares with about two-thirds of a billion's worth back in the 'Twenties.

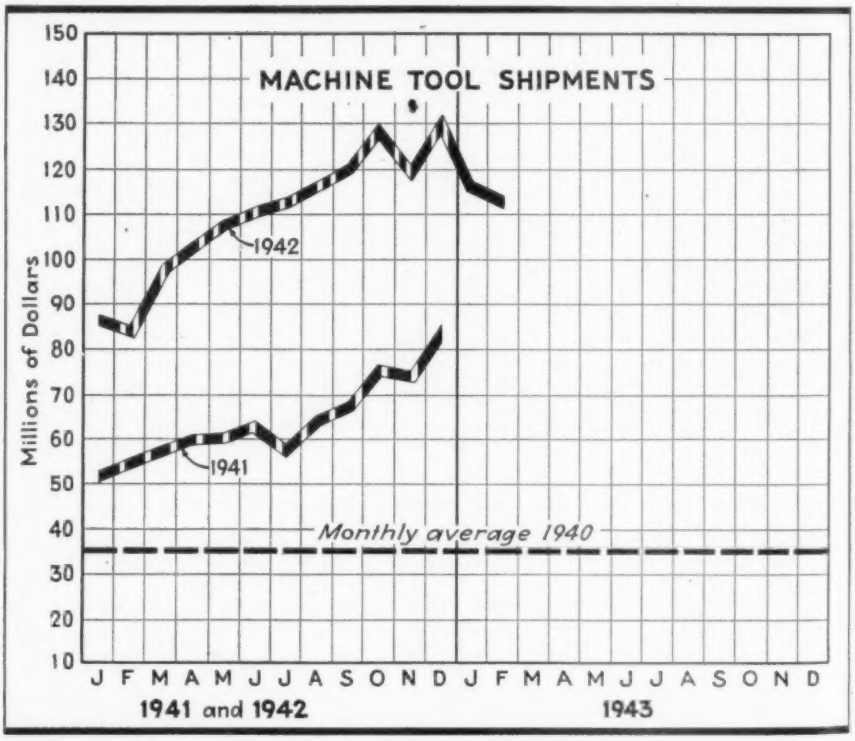
Expect Results Of Order Query The War Production Board and the armed services have been going over their machine tool requirements and eliminating all orders not absolutely necessary. Cases exist where large numbers of new machine tools have been delivered and are standing in warehouses unpacked, awaiting the time when they really will be needed. It is believed that the current careful investigation will result in considerable further cancellations of outstanding machine tool orders.

Nobody knows at what level machine tool operations may be stabilized late this year. With the lively start in the first quarter, when total output was around $325,000,000, 1943 should be the second best year on record, exceeded only by 1942. New tooling programs, necessitated by changes in the war situation and replacement of wornout equipment, should provide considerable business. War contractors also may have the opportunity for the first time during the war of plugging weak spots in their manufacturing set-ups with new and more efficient machines.

Price Squeeze Worries Industry One point worrying the machine tool industry is that it must continue to operate with price lists established in 1941 and earlier and frozen by OPA in October, 1941. Substantial increases in labor and material costs have occurred since then. With the declining rate of new business and a corresponding lowering of production the balance of this year, the industry is fearful that shortly it will be faced with the danger of producing at an actual loss.

Transportation Binds Production Lack of sufficient ships to move the vast quantities of war goods being turned out is requiring extensive rescheduling of plants making these goods. In some cases large contracts for weapons have been canceled. In other instances important ordnance works have shut down temporarily. Airplanes are the one item where no reduction in operations has been made. In fact, the greatest pressure is being exerted to expand aircraft output as rapidly as humanly possible.

Materials supplies have not been adequate to maintain steady production in some war plants. Top executives in organized labor are receiving an increasing number of complaints from local union officers to the effect that their members are not getting in regular time because of interrupted materials flow. Top-side policy that any new raw materials productive facilities must come in this year has not been changed. This limitation, however, may soon be removed.



Little Changed—In February the machine tool industry shipped 25,500 units, valued at $114,273,000, which was 2.6 percent lower than during January. During the second month, the backlog was reduced by 7.9 percent, with average time required to complete unfilled orders dropping from 6.8 months in January to 6.5 months in February. Shipment figure is based on reports of 381 manufacturers, three less than reported for the preceding month

Services Agree to Uniform Renegotiation Procedure

Rehabilitation of postwar markets is urged as industry accepts renegotiation. Efforts to attain uniformity results from Congressional threat to combine three boards

WASHINGTON—Agreement by the four price adjustment boards on a uniform renegotiation procedure will not answer any important grievances of war manufacturers against renegotiation itself.

The agreement is a reply to the Truman Committee's report which mildly criticised renegotiation procedure; the four boards were already tending toward the procedures recommended by the Committee.

Thus, the Committee's recommendations and the price adjustment board's reactions are of minor importance. Industry has pretty much made up its mind to live with renegotiation as is.

Manufacturers now have their eyes on postwar cash reserves, which they feel the government must either allow them, furnish them, or both, for rehabilitation of plant, equipment and in some cases market, sacrificed to the war. Renegotiation has major news importance only in so far as it bears upon the matter of postwar reserves.

Rehabilitation Stressed

Rehabilitation of market, or compensation for the loss of market, is especially applicable to the machine tool industry which has not only been tremendously expanded, but whose war output will, in the opinion of many, continue substantially to fill peacetime requirements for years to come.

The four price adjustment boards referred to are in the Navy, Army, Maritime Commission and Treasury. They were set up under an act of Congress to limit wartime profits. The Truman Committee is a special group in the Senate, constantly investigating on various phases of war production.

Renegotiation Generally OK'd

The fact that manufacturers have accepted renegotiation for better or worse is attested by their failure to show up at the Truman hearings. They didn't feel it was worthwhile to make protests. In fact, most everybody is in sympathy with the principles of renegotiation. Both the manufacturers and the Truman Committee find fault only with the methods used, not with the objective. Congress and the Administration and industry all want to suppress profiteers, and they want to cut the cost of the war.

No provision is made in the law whereby the price adjustment boards can permit contractors to take larger than reasonable profits on the ground that funds will be salted away to offset war sacrifices when peace comes. The boards are instructed by Congress to hold war industries down to reasonable current profits.

Legislation will soon be proposed which will provide that war contractors may accumulate reserves, or that they shall receive subsidies after the war, or both. Such legislation may propose that the present price boards authorize the reserve accumulations, or it may set up other agencies to handle both reserves and subsidies.

Auto Industry Will Need Help

The automobile industry is one example of the need for government help. Manufacturers have thrown out their equipment, and have torn down their assembly lines, so that they have nothing left but hollow buildings. And because they have been out of the auto business, a lot of new competitors, with bright ideas and new knowledge of materials and processes, have lined up for the starting gun. The machine tool situation, which everybody now understands, is in reverse, expanded ten times over normal, and is in a worse position than autos because the tool market is glutted, while a heavy demand is waiting for the car makers.

Hitler is the world's worst problem; the war will eliminate him, but a thousand lesser dilemmas pile up in the meantime. One of them will be the method of compensation of industries for war losses. The idea is not to make good on sacrifices as such, but to rehabilitate the industries, which we must have.

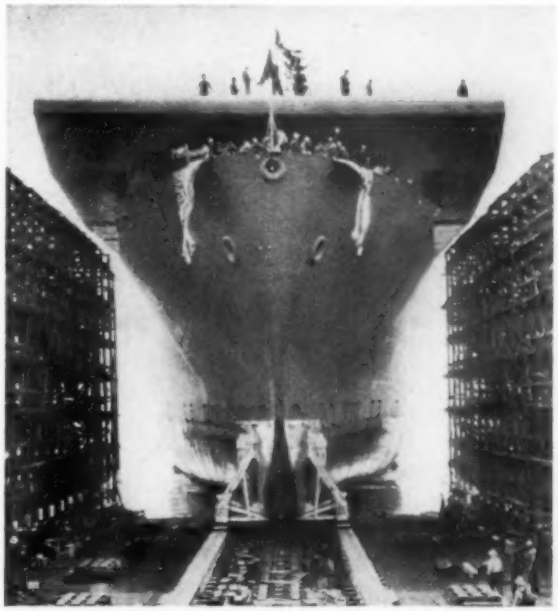
Getting back to the price boards: They are trying to set up uniform procedures, curtail the human element so that, insofar as possible, you will get the same deal, whether you are renegotiated by the Army, Navy, or whichever. The ideal can only be approached; there are too many intangibles involved. You will not, of course, be handled by more than one board.

One thing that makes the boards really try for uniformity is the Congressional threat of a combine—one board for all. The prospect of any such intimacy is abhorrent to Army and Navy, and to the Navy and the Maritime Commission. Pressure for such a pool of renegotiators is off for the present.

URGE MAXIMUM TOOL USE

MANSFIELD, OHIO—No more machine tools should be built for war production than are actually required, said Charles J. Stilwell, president, The Warner & Swasey Co., speaking before the annual meeting of the Manufacturers Club.

"Machine tool builders have repeatedly urged that all existing machine tools be used to their maximum extent, that orders for new machine tools be carefully reviewed by the War Production Board and the services, and that war production plants be inspected to see whether or not all new machine tools in those plants were actually being used," Mr. Stilwell said.



First of a Series—A Henry F. Kaiser shipyard launches a new ship and a new building program. The first of a type of aircraft escort carrier, which the West Coast shipbuilder plans to produce at the rate of six a month, was christened by Mrs. Roosevelt

Associated Press

Shift From Liberty Ships To Favor Faster Vessels

WASHINGTON—For months the Maritime Commission has been talking about beginning a shift from Liberty ships toward greater production of its original "C" designs and is now about ready for action. First conversion of ways from EC-2 back to C production is planned for the Carolina Shipbuilding & Drydock Company, Wilmington.

There are several reasons for this change of policy. The Liberty program was laid down in the first place to hurry up any tonnage that would float and make headway. Secondly, the Liberties could be pushed with old-style reciprocating engines, and there were few turbines or diesels for merchant shipping; Navy and the power industry took nearly all.

Now, production of turbines, diesels and reduction gears has been jacked up until there is enough for the commission to increase its C ship program. And, some seamen in the commission and in the Navy are beginning to think it might be more sensible to build C ships, whose speed permits them to dodge submarines, than to keep on doggedly pouring out Liberty ships faster than they are sunk.

Not the least consideration is the postwar prospect. Out C ships will match any cargo vessels afloat after the war, but the Liberties, if our Merchant Marine tried to use them, would be beaten immediately by the finer ships of competitor nations—just as our first world war ships were beaten and sustained by subsidies.

This line of reasoning indicates that the commission will eliminate Liberty ship production by steps, depending on the Allied supply situation, until it is stopped entirely. It is true that Liberty tonnage can be built faster than C tonnage, and the rate of conversion will have to take into consideration all factors in the equasion.

Evidently the shipping industry and the commission are not much impressed with the possibility of cargo loss to air transport. They will lose a good share of their top deck passengers, but these are generaly regarded as lost leaders anyway.

It should be noted that the C ship program was never entirely stopped. The program for coming fiscal year was 30 C-1 of concrete, 3 standard C-1, 82 C-2, 24 C-3 and 4 C-4.

BEWARE OF THE BAZOOKA

WASHINGTON—The War Department only recently decided to publish meager information about the bazooka, a revolutionary weapon for use against tanks, pillboxes and other mechanized defenses. It is light enough to be held and fired from the shoulder of one man and will break down cast steel, bridge girders, railroad rails. That is all the Army says. It is reliably reported that a weapon working on the same principles has been developed and put to use by the Russians, and no doubt all belligerents will have something similar eventually.

Col. Johnson Seeks to Put Teeth Into SWPC Rulings

WASHINGTON — The Smaller War Plants Corporation is now practically independent of WPB. Under the new set-up, the only connection is that Col. Robert Johnson, SWPC's boss, is WPB vice-chairman, reports to Donald Nelson.

Biggest change resulting from Johnson's appointment is that he uses the corporation's statutory power to take prime contracts from the procurement agencies. Lou Holland his predecessor, regarded this power as a sort of last ditch club in the closet, to be used only if the procurement agencies proved recalcitrant.

Johnson considers SWPC's power a tool rather than a weapon. It offers a means to coordinate the facilities of many small plants, provide them technical services, protect them from the red tape of dealing with the government procurement agencies.

Johnson is about to launch in New York City a spectacular program to induce department store and similar large buyers to throw their business, wherever possible, into small firms. He will utilize the rather complete list of small plants which SWPC field offices maintain. If the idea works in New York it will be tried in other large cities.

In the munitions field, Johnson believes that subcontracting offers more hope than the crumbs of prime contracts remaining to be let. At Johnson's instruction, the Army, Navy and Maritime Commission are circulating questionnaires among the 252 largest prime contractors designed to show what percentage of their work is subcontracted and a list of the subcontractors by size groups.

Where he feels that the volume of subcontracting is unsatisfactory he'll put the heat on the firm for more. If the firm isn't responsive, Johnson can order the procurement agency to place the firms next renewal contract with SWPC. Johnson undoubtedly has the legal power to do this and probably intends to exercise it if he has to. It remains to be seen whether he has the courage and strength to get away with it.

Wilson Dominates WPB

WASHINGTON — Charles Wilson's domination of the War Production Board is clearly revealed in the new organizational framework which he has been setting up ever since the ouster of former Program Vice-chairman Ferdinand Eberstadt gave him a clear hand. What doesn't show, is that he is now co-chairman of the Board in all but name. He has been authorized to exercise personally the full authority of Chairman Nelson. Only exception is the authority over the Smaller War Plants Corp. vested in Nelson by statute.

In addition to his general supervision over WPB, Wilson has retained direct personal control over aircraft and ship production policies. He also keeps a close finger on the actual workings of CMP by having the aluminum, copper, and steel branches report direct to him. So does the Office of Civilian Supply, a hot spot.

May Extend Deadline

WASHINGTON—Some relaxation in the WPB rule forbidding approval of new facilities unless they will be in production in 1943 is now possible, Donald Nelson has intimated before the Senate Small Business Committee. For about a year, Jan. 1, 1944 has been an informal deadline for facility projects. If they couldn't be finished by then they wouldn't be approved.

Mr. Nelson did not indicate how the formula might be relaxed, but he had in mind expansion of facilities for production of raw materials. The country is already overbuilt on manufacturing facilities in relation to raw materials supply. Ever since Vice Chairman Charles Wilson became the leading force in WPB, increased production of raw materials has been a major objective. So far this has been directed at increasing output of existing facilities; now thinking is for new capacity.

Thinking on the steel program goes as far as 10,000,000 additional tons a year of capacity. Sponge iron may provide the 5,000,000 tons of new iron capacity to avoid some of the transportation difficulties associated with blast furnace expansion. Another effect would be new pressure on scrap to provide the extra 5,000,000 tons.

Chief reliance for new copper sources is to be placed on tapping, at government expense, numerous pockets of rich ore which are too small to be worth the cost of a shaft on a normal commercial basis.

INSIDE DETROIT

BY SILER FREEMAN

Henry Kaiser's visit stirred speculation that he will enter postwar auto field. The Automotive Council speeds manpower survey. Many producers prepare for induction of able-bodied workers. Drive for more women workers planned

Will Kaiser Make Cars? The fabulous Henry Kaiser's visit to Detroit brought many rumors, no tangible facts. His swoop into the automotive center of the world revived stories that he was to enter the automotive field after the war and would give the Big Three a tough battle.

But in automotive circles there was little discussion of his stopover. In fact, most of the top executives in the industry were out of the city when Kaiser dropped in and commented about his visit that all they knew they read in the papers. But if any of them was even mildly interested in what Kaiser was doing here, he hid it very well. There were few conjectures of what his conference with Tank-Automotive officials implied. The Army men were very reticent to discuss it.

Report "Too Previous" Previously, there was a rumor that Kaiser had definite plans to enter the automotive field, that he had an option on one of the smaller companies who were willing to be adopted by him and that a recently organized engineering firm was to be given the job of designing a "different" car which he was to put into competition with the Big Three. The head of the enginering firm called the report much too previous.

None of the automotive companies, those in position to be taken over, would acknowledge they had even been consulted about such a move. As for the other companies, they stood on Alvan Macauley's invitation to Kaiser to move in if he wanted to.

The sum total of Kaiser's trip seemed to be a lot of good press notices and no real results.

Rush Survey Of Manpower The Automotive Council for War Production is moving fast in its survey of the entire manpower situation. Three subcommittees have been set up and a plan of action adopted for gathering the material on which the Council's main committee under C. E. Wilson of General Motors will make its recommendations to the industry.

The Council is attacking the problem with the same vigor that brought about the solution to the machine and tooling problem. It is working on the established theory that transportation, housing and the care of working mothers' children hold the solution to the manpower shortage.

It will be some time before its findings will be in shape to make recommendations. But reports of progress are heard on all sides. An important meeting to go over the entire manpower problem was held in Washington last week, with all top executives sitting in. It was a hush-hush affair.

Uneasiness Over Draft Justified While the auto companies still deny there is a manpower shortage in the immediate future, they have some reasons to grow uneasy after being advised by state selective service officials at a meeting that they can figure on losing every able-bodied worker, no matter how essential, between 18 and 38, within the next six months. Those who have set up manning tables have prepared for it.

Firms are being urged to release their single men and those without children as quickly as possible to keep fathers on the job as long as they can. But even for the latter, selective service chiefs hold out little hope.

State Manpower Chief Montague Clark sees a shortage of 93,000 workers by the end of 1943, figuring in the use of more women, school students and the handicapped. So far the estimates have been fairly accurate.

Plan to Enroll More Women The Detroit office of the U. S. Employment Service is planning another drive to get more women into the plants. It may take the form of another registration of women such as was taken last summer. Many of those who signified a willingness to work in plants in the first registration have changed their minds and an effort will be made to get a large proportion to get into production work.

While the number of women in the plants has been increasing gradually, government officials here are still dissatisfied. They believe many are left who could do useful work and who must be "sold" on the idea. Failure to set up proper facilities to care for children is blamed for the reluctance of many of these women to leave their homes.

Willow Run Program Lags Housing additions at Willow Run are being rushed to draw workers to the bomber plant but with no appreciable success. The program is still lagging in spite of pressure from industry and the state. No progress has been made on transportation, the other factor which is holding back hiring for the plant.

Prelude to Bombing—Apparatus for painting loft lines on a fuselage frame section, to determine rivet locations on final assembly in the Fisher Body aircraft unit, speeds this operation 20 times over former hand methods

At the Westinghouse Machine Tool Electrification Forum—(left to right) W. J. Pelich, manager, Operators Service Bureau, Warner & Swasey Co.; C. F. Stainback, manager, Industrial Department, Westinghouse Electric & Mfg. Co.; Tell Berna, general manager, National Machine Tool Builders Association; James Y. Scott, president, Van Norman Machine Tool Co.; G. Edward Pendray, assistant to president, Westinghouse Electric & Mfg. Co.

Post-War Problems Topic At Westinghouse Forum

PITTSBURGH—"If the machine tool industry has something new to offer a mechanically minded post-war world, it will have nothing to fear." James Y. Scott, president, the Van Norman Machine Tool Co., in making that statement, struck the keynote of the Eighth Annual Westinghouse Machine Tool Electrification Forum, held here April 6 and 7.

"Let's face the facts," he said to more than 300 executives and engineers of 125 machine tool companies, representing 90 percent of the industry's capacity. "The machine tools poured into industry during the past three years—more than the total number dur'·g the past 40 years—are going to stay there."

Thus with the machine tool industry faced with a diminishing demand—a post-war problem before the end of the war—interest at the forum was centered on the aid that manufacturers of electrical equipment can give in making current machine tools obsolete. An outstanding example of this was presentation of an a.c. variable speed control. The system consists of a single or polyphase grid-controlled Thyratron tube rectifier which takes power from an a.c. line and rectifies into direct-current output.

Quick Training Discussed

Current problems on the production front were discussed. Dr. Horace Frommelt, director of education, Kearney & Trecker Corp., presented the methods employed by the machine tool industry in developing a streamlined training program to make available in a matter of weeks men and women capable of performing special operations on machine tools with the accuracy usually attributed only to highly skilled mechanics.

W. J. Pelich, manager of the Operator's Service Bureau, and R. H. Clark, electrical engineer, the Warner & Swasey Co., presented the principles of tool sharpening. Through slow-motion movies he illustrated the action of cutting tools, the need of maintaining proper cutting tool angles, and how these directly affect production.

Induction Heating Advantages

Practical applications of induction heating were presented by Frank W. Curtiss, chief engineer, Milling Machine Division, the Van Norman Machine Tool Co. He said, "High-frequency induction heating is going to result in the development of manufacturing techniques that will offer two outstanding advantages in industry—an economical cost of heating metals and high production rates with uniform results."

"Produce More With Less," a current war production problem, was discussed by John Gammel of the War Production Board, pointing his remarks specifically at electrical equipment.

Round Table on Drives

Hydraulic versus electric drives was the subject of a round table discussion of Wednesday afternoon. Discussion leaders included R. A. Cole, Norton Co.; E. Y. Seburg, Barnes Drill Co.; L. M. Corbett, Heald Machine Co.; H. N. Seyferth, Ex-Cell-O Machine Co.; G. M. Glass, Gisholt Machine Co.; B. P. Graves, Brown & Sharpe Mfg. Co., and R. Herrstrom, Rockford Machine Tool Co. Individual applications of each type of drive were discussed, their relative merits presented. It was stated that combined electric and hydraulic drives could frequently be considered even when a preference is shown for one or the other.

Survival of Tool Industry Depends on Cash Reserves

CLEVELAND—The machine tool industry cannot afford to give up a dollar of its earnings under renegotiation procedures, according to a report on the industry made by A. G. Bryant, president, Bryant Machinery & Engineering Co. and vice-president, Cleereman Machine Tool Co. The report was the result of a request by the War Department for factual information about the operations of the industry during 1942. It supplements an earlier report submitted to Under-Secretary of War Patterson on October 24, 1941, giving the conclusions reached from a study of the cost of distributing machine tools from 1937 to July 1, 1941, inclusive.

Mr. Bryant concluded that machine tool price levels must not deteriorate and in the face of higher costs and much lower volume later this year, some upward adjustments may be necessary. He pointed out that any weakening in the discount basis to long-established machine tool distributors will be disastrous not only to them but to the industry as a whole, and therefore to the peacetime economy as well as to America's wartime effort.

If these three fundamentals will be supported by the industry, by the general public and by the government, states the report, "We believe the industry can be expected to survive, despite the fact that its output the last four years has been so staggering that it has practically put itself out of business for at least a decade." The report says that machine tool production declined from $222,000,000 in 1918 to $23,000,000 in 1921. It then asks what will happen when a comparable drop occurs at the end of this war.

In the five-year period of 1937 through 1941, declares Mr. Bryant 54 percent of accumulated gross earnings of the machine tool industry went for taxes, 18 percent was for dividends and 28 percent was devoted to plant expansion to meet the country's defense requirements. Since corporation taxes now are about 80 percent of earnings, it is apparent that there is not sufficient left for even moderate reserves for contingencies. Something more than "moderate reserves for contingencies" will be needed in this business during the next few years.

Analysis of financial reports of machine tool distributors responsible for handling at least 80 percent of all the machine tools sold through dealers in 1942 shows that the gross revenue received amounted to 11.04 percent of sales volume. A summary of reports of these distributors shows that their combined net profit after taxes was 1.68 percent in the peak year of 1942.

Last year not more than 40 percent of the machine tool volume was handled through distributors. Whereas, in normal times, the report stated, about two-thirds of the total volume is sold by distributors.

WARTIME WASHINGTON

BY BLAINE STUBBLEFIELD

Foreign sales of surplus machine tools proposed to create home market. Subsidies or war profits suggested as a means of financing post-war reconversion. War Production Board may back incentive plan to bolster lagging plant output

Machine Tools Over the Ocean

A bright, but old, idea is being tossed about the Capital: sell a lot of the surplus machine tools and machinery to non-mechanized countries in South America, China, Africa and so on, to create a market here at home.

This proposal has been discussed around conference tables—in the Department of Commerce, in the Machinery and Allied Products Institute. No agency in authority has yet done anything about it.

Those in favor say that the foreign purchasers of our excess machine tools and machines would use them to raise their standards of living and would inevitably purchase more goods than ever from us as a result. The opposition reiterates the old argument that the purchasers would use the machines to make products for themselves which they would otherwise buy from us.

Who'll Pay for Reconversion

The method to be used in financing reconversion of war plants to peace production is one of the hottest post-war issues now facing Washington. It will have to be solved one way or another and proposed methods cover a wide range. At one extreme is a view, with some support in the War Department, that reconversion ought to be recognized as part of the cost of a government contract just as conversion was. This would imply that the government would pay for it outright at the termination of war contracts.

At the other extreme is a subsidy plan suggested by the National Resources Planning Board, which may be taken to represent the extreme New Deal view. NRPB suggests that the government make grants to private industry for reconversion—conditional on cooperation with a planned high-output economy.

Aid Put up To Congress

The middle ground—on which some sort of action is likely—is to permit war contractors to set aside part of their present profits to finance reconversion. Nearly everyone except the Treasury now accepts this proposal. Even the NRPB recommended amendment of the tax law to permit tax-free accumulation of reserves for conversion. The Truman committee, in its report on renegotiation of contracts, suggests that Army and Navy renegotiators permit deduction of such reserves. The renegotiators, though sympathetic to this view, feel they lack statutory authority, would like Congress to act. Moreover, as long as the tax law is unchanged, they argue they'd have to approve reserves five times what was needed so that there'd be enough after taxes.

The problem falls in the lap of Congress, and Congress will probably act.

Incentives for Industry

WPB is getting ready to push an incentive pay plan—under which it would grant percentage pay increases in plants which show increased output per man-hour. The plan has had the go-ahead from the White House. There'll be no attempt to apply it all at once broadside, but it will be got going immediately in selected plants. First application will be in aircraft plants and parts.

Designed to be installed eventually throughout war industry, the plan originated in the War Production Board, has been approved in the National War Labor Board.

Pay Rise For Everyone

Briefly, this quietly worked-up plan provides that whenever a plant's output per man-hour rises by a given percentage, the pay, but not the wage rate, of everyone in the plant, from sweeper to president, will be increased by the same percentage. And the government would bear the cost of the extra pay.

Washington figures that such a plan could be applied readily in the plants of prime war contractors. Means for its application to subcontractors, materials producers, and other essential industries are now being studied.

The plan has already been tried experimentally in four war plants, where it resulted in increased production and satisfaction to both management and labor. WPB officials think such a scheme, broadly applied, could step up production 10 to 30 percent.

At NWLB, appeal of the incentive plan arises from the fact that is pay increases would leave the wage stabilization program formally unchanged. Sponsors add that it would not risk permanent changes in the wage structure, as a simple wage increase would, and would not boost the cost of armament to the government.

Press Ass'n.

Jap Sub Reaches Washington—A two-man Japanese submarine which participated in the attack on Pearl Harbor was placed in exhibition in front of the Capital, to promote the sale of war bonds and stamps

ASTE Meeting Studies Production Problems, Methods

MILWAUKEE—One hundred and thirty eight exhibitors displayed new and improved metal-working machines, tools, accessories and materials at the "war production edition" of the Machine and Tool Progress Exhibition held here on March 25, 26 and 27 in connection with the eleventh annual meeting of the American Society of Tool Engineers. Production engineers and executives from plants in all parts of the United States, as well as from a number of Canadian plants, attended this three-day meeting. Total attendance was estimated at well over 10,000.

Officers of the society for 1943-1944, who were elected at the meeting of the board of directors on Thursday, were installed in office Saturday night. They are: president, Ray H. Morris, vice-president of Hardinge Bros., Inc.; first vice-president, Douglas D. Burnside, superintendent, Quickmeal Division, American Stove Company; second vice president, C. V. Briner, assistant to president, The Pipe Machinery Company; secretary, Earl V. Johnson, engineer, Firth-Sterling Steel Company; treasurer, Floyd W. Eaton, assistant district representative, War Manpower Commission, Detroit. Adrian L. Potter was reelected executive secretary.

Ray H. Morris, Douglas D. Burnside, C. V. Briner and Earl V. Johnson were elected as A.S.T.E. officers for the coming year. Floyd Eaton, the new treasurer, was unable to attend the meeting

Brig. Gen. H. F. Safford, office of the chief of ordnance, the principal speaker at the annual dinner, talks with A. H. d'Arcambal, Pratt & Whitney, and Col. Haviland Wright (left, above). George Wise, Minneapolis-Honeywell, and F. J. Schmitt, D. A. Stuart Oil Company, discuss society matters (center, above).

Capt. F. J. Rawson is flanked by L. C. Gorham of Gorham Tool Co., and Charles Gorham, Greenfield Tap & Die Corp. (right, above)

The following national committee chairmen were appointed: program committee, Frank W. Curtis; public relations committee. G. J. Hawkey; constitution and by-laws committee, I. F. Holland; standards, E. W. Ernest; editorial, Andrew E. Rylander; industrial relations, Ben C. Brosheer; education and training, Otto W. Winter; membership, W. B. Peirce.

Among the interesting developments displayed at the exhibition were recently developed internal grinders made by Sav-Way Industries and by Bradley Machinery Company, a precision boring machine with an adjustable table in place of the usual fixed table offered by Stokerunit Corporation, and a new induction heating unit made by the Van Norman Machine Tool Company. The Progressive Welder Company exhibited several improved spot welding machines, including a storage battery unit, and announced a new "Frostpoint" electrode for spot welders equipped with the Frostrode electrode cooling system.

Both Brown and Sharpe Manufacturing Company and Standard Gage Company exhibited development models of glass plug gages, while Brown & Sharpe also displayed a glass surface plate which appears to have good possibilities. It is not yet ready for marketing, but development work is being pushed. Super Tool Company, showed a new line of carbide tipped milling cutters with cast Meehanite bodies.

Malcolm F. Judkins discussed Hyper-Milling at a technical session

Pres. H. F. Bakewell of the company bearing his name, exhibits recently improved tapping machines

Don S. Connor, new sales manager for Micromatic Hone Corp., spent most of his time in his company's booth

F. R. Crone, Lincoln Motor Co., and L. M. Cole, Warner & Swasey, attend the meeting of the board of directors

Below—P. O. Wernicke and L. J. Radermacher, Stokerunit Corp. officials, were busy explaining their machines to visitors

Above—Retiring Pres. O. W. Winter, Sav-Way Industries head, shows an internal grinder, one of the new machines displayed

P. W. Brown, Wright Aeronautical Corp., and E. C. Brandt, WPB, spent considerable time viewing exhibits

Below—F. W. Curtis, Van Norman Machine Tool Co., ASTE past president, explained his company's induction heating unit

SPOTTING THE AIR NEWS

Airmail pickup network seen as possible aid in taking up the postwar slack. Widespread modification centers speed production. North American reveals production of A-36's. Kaiser yard begins delivery of auxiliary plane carriers

Air mail pickup again engages national attention as the Civil Aeronautics Board starts an over-all investigation of its postwar possibilities. The metalworking industry's interest in this enterprise is in the probable requirement of a large number of airplanes. CAB's survey is part of a larger inevitable development, including delivery of all first class mail over night, and extension of the air express system to the whole country, at lower rates. Added up, these new services will amount to a new feeder system that will total more mileage, and employ far more airplanes and more workers, than the total miles and workers and planes of the present trunkline airway system.

All - American Aviation, organized some years ago by Richard du Pont has expanded air mail pickup service in six Atlantic states. A steel pole suspended from a small airplane, is fitted with a special hook which grabs the mail bag off a line between two "goal posts." Mail and ordinary express is delivered simply by throwing it overboard in a pouch designed to absorb shock. Fragile articles are let down on parachutes. One "flying postman" can cover a whole valley full of towns, with pickup and delivery service, in an hour or so. CAB already has 38 applications on file from various operators for pickup services that would network every thickly settled community in the United States.

Special new planes will be needed for the feeder service. They will be short range, high lift, low speed, low cost craft, more like designs of a decade ago than those of today. Some will have single engines, some two. CAB will hold a cross-the-board industry hearing on the whole subject soon, and it is expected many engineers will show up with new airplane designs in their brief cases. The pickup system cannot handle passengers—that is where the helicopters and the autogiros come in. Also interested will be glider manufacturers, who have demonstrated that powerless passenger craft can be hooked to tow planes in flight.

Mr. Roosevelt talked at his press conference about airplane modification centers — sub-plants which make changes in the planes required on different fronts so that the factory production lines will not be slowed down. He said that new features are developing, on all types of planes, every few weeks. There are about 30 modifications centers in various parts of the country, and the average time required for changes and special adaptations on each plane is 30 days.

Wolf-Pack Hunter—The Vega PV-1, a nautical version of the Vega Ventura bomber, is now in production. Hailed as the new scourge of the submarine, it carries "ash can" depth charges or torpedoes and is the first sub-buster in production to fill the Navy's need for twin-engined land-based aircraft with adequate range plus both defensive and offensive armament. It is powered by two 2,000-hp. Pratt & Whitney engines

North American Aviation has just made public that it has been building dive bombers, under an Army order, which are conversions of the P-51 Mustang fighter. Early in the war, NAA sold the Mustang design to the British, but at that time the U. S. Army, not much interested, took only two. But Army did place a substantial order for the conversion to dive bomber, designated A-36. The attack model looks about the same as the fighter, except it has wing flaps, to brake the diving speed, and racks under each wing to carry the bombs. Instead of bombs, throw-away auxiliary gas tanks can be carried, to stretch the ship's range. Later on, the Army did order large numbers of the P-51, and it is now frequently mentioned as the world's best fighter. Both the P-51 and the A-36 were equipped with Allison engines, but the P-51 is now being changed over to the Rolls Royce Merlin 61.

A new aircraft carrier, designed to serve both as a combat carrier and as a transporter of airplanes is being built by Henry J. Kaiser. They are being produced in a 12-way shipyard at Vancouver, B. C., at the rate of six a month. In addition to our regular fleet carrier program, scores of auxiliary carriers—roughly merchant ships with flight decks—are under construction. Some are already in service and have been in combat. They are equipped with catapults for use when deck takeoff is impractical.

A new low-pressure chamber, called the strato-trainer, has been put in operation by Boeing Aircraft Co., for physiological training of high-altitude experimental crews. One of the main features of the chamber is its ability to exhaust so rapidly as to simulate a rate of climb six times as fast as the rate of existing pursuit planes. During a test run, the chamber produced an atmosphere equal to more than 50,000 ft. altitude. It can produce an altitude of 35,000 ft. in 2½ minutes, 50,000 ft. in four minutes. The fast rate makes possible a study of "aeroembolism," which is the aerial equivalent of divers' bends. Crews will learn safety precautions while using oxygen at high altitudes. The size of the strato-trainer permits the training of complete flight crews at one time. Boeing is one of the foremost pioneers of high altitude operation, having developed the Stratoliner, a passenger plane with pressurized cabin, and the B-17 Flying Fortress, a super-high altitude bomber.

WPB Rules on Hand Tools

WASHINGTON—The Tools Division of WPB has issued Order E-5-a to help machinists obtain new gages and precision hand tools which they had trouble getting on the A-10 rating previously permitted them.

The order covers new gages, and precision measuring hand tools such as micrometers, verniers, calipers, and other precision tools and measuring devices, whether sold to the manufacturer or to the individual employee. It restricts sales to approved users, distributors and approved employees, beginning May 1, on purchase orders rated A-9 or higher. Purchasers are allowed only a 30-day supply.

Individual workers who require precision tools are assigned a preference rating the same as that of their employers under Controlled Materials Plan, for maintenance, repair and operating supplies. For example, a worker in an ammunition plant would be entitled to use a rating of AA-1 because that rating is assigned to ammunition plants' maintenance orders. Orders must be accompanied by certification of worker and employer that the tool is necessary.

Recently, measuring machines were taken out of Orders E-1-b and E-5 and put under Order E-9. Order E-5 is revoked, and E-5-a is set up for the tools above described. There still is no order covering chucks.

Civil Aircraft Development May Provide Postwar Boom

LONDON—Civil aviation, furthered by wartime developments, should provide the machine tool industry with a market far exceeding that of pre-war years, according to a recent editorial in "The Machinist." No other industry was so completely eclipsed as aircraft after the first world war. But the circumstances were then different; civil aviation had yet to be born, whereas at the end of this war civil aviation will be resuming progress after a temporary interruption.

As a first step, surplus large warplanes will be converted to cargo and passenger usage. This will be followed by the commissioning of newly designed aircraft, probably of greater payload capacity than yet seen, and entailing a production program that only a very large industry could undertake. Each of these steps will materially help to insure the continuance of a high degree of activity in the industry.

Production potentialities of the wartime aircraft industry for the new postwar program will, of course, be enormous. New machine tool equipment may not then be one of the immediate needs. But it will only be a question of time before the industry ranks as an important market in that respect.

NAMES in the NEWS

Helge G. Hoglund

Helge G. Hoglund has been named vice president of Van Norman Machine Tool Co., Springfield, Mass. For the past ten years Mr. Hoglund has been sales manager of the Machine Tool Div., and will continue to be in charge of sales of that division. In addition, he will have control of sales of the new Electronics Div. which is manufacturing induction heating equipment. Prior to joining the company in 1933, Mr. Hoglund was associated for ten years with General Electric Co. as manufacturing, production and sales engineer.

Emil T. Johnson

Emil T. Johnson, formerly works manager of the Lycoming Div. of Aviation Corp., Williamsport, Pa., has been promoted to the position of plant manager. Since joining Lycoming in 1941 Mr. Johnson has been master mechanic, plant superintendent and works manager. Previously he was master mechanic and division superintendent in charge of radial engines at the Buda Co., Harvey, Ill. Herbert J. Glasby, who was formerly factory manager of Oakes Products Div. of Houdaille Hershey Corp., automotive product makers, North Chicago, succeeds Mr. Johnson as works manager.

John Rosevear

John Rosevear, formerly staff assistant in the industrial engineering and equipment department of Westinghouse Lamp Division, Bloomfield, N. J., has been appointed manager of the new Fairmont, W. Va., works and will coordinate the manufacturing activities of the flourescent plant, the new glass factory and an electronic tube plant. Mr. Rosevear joined Westinghouse in 1922, and two years ago became superintendent of work engineering.

R. X. Raymond, for the past 15 years associated with D. O. James Mfg. Co., Chicago, manufacturers of gears and gear reducers, is in charge of the Minneapolis office of the company with headquarters in the Fawkes Bldg.

Carter C. Higgins has been named a vice president of Worcester Pressed Steel Co., Worcester, Mass., in addition to his position as general sales manager.

Charles R. Cox

Charles R. Cox has been named president of the National Tube Co. and of Tubular Alloy Steel Corp., Pittsburgh, subsidiaries of United States Steel Corp. For the past two years Mr. Cox has been executive vice president of National Tube Co., and succeeds Benjamin F. Harris, who recently resigned and has become consultant to Mr. Fairless, president of U. S. Steel. Mr. Cox joined the Ellwood Works of organization in 1934 where he became general superintendent of the plant. In 1936 he was appointed vice president in charge of operations of the tube company with offices in Pittsburgh.

H. C. Deckard

H. C. Deckard has been made division manager of two divisions of the Aviation Corp., the Republic Aircraft Products Div. in Detroit and the Northern Aircraft Products Div. in Toledo. Prior to this appointment he was handling special production assignments at the Ford Willow Run plant. From 1924 to 1928 Mr. Deckard was general superintendent of Taft-Peirce Mfg. Co., Woonsocket, R. I. Later he was connected with Fairchild Aircraft Corp., Hagerstown, Md.

Frank S. O'Neil has been advanced to vice president of the Link-Belt Company's Indianapolis operations. He joined the organization at the Pershing Road plant in Chicago, where he worked in the foundry, machine shop, cost, rate setting and production departments. He was transferred to the Indianapolis plant in 1916 and has been general manager since 1939. He continues to be located there.

John W. Hacker has been appointed general superintendent of the Christy Park Works of National Tube Co. at McKeesport, Pa. Mr. Hacker has been associated with this U. S. Steel Corp. subsidiary since 1940, becoming chief industrial engineer in 1942.

G. L. Dannehower

Gilbert L. Dannehower has been appointed sales manager of Swiss American Gear Co., Jersey City, N. J. He will also manage the sales of Cosa Corp., Chrysler Bldg., New York City, importers of Swiss precision machinery. Mr. Dannehower was formerly manager in the United States for the Johansson gage block company of Sweden, and for the past four years has been connected with Walker-Turner Co. of Plainfield, N. J.

Francis J. Trecker has been named secretary of Kearney & Trecker Corp., Milwaukee, which was founded in 1898 by his father, Theodore Trecker, Sr. and the late E. J. Kearney. In 1939 Mr. Trecker becames sales engineer of the company, and in 1940 he was placed at the head of the company's subcontracting program. A year before Pearl Harbor he was called to Washington as consultant to the War Department subcontracting service. The administration of plans for the defense plant addition to the Kearney & Trecker plants in 1942 was handled by Mr. Trecker.

Robert H. Morse, Jr. has been named general sales manager of Fairbanks, Morse & Co., Chicago. He has been with the company and its subsidiaries since 1916. After spending ten years in the manufacturing divisions, Mr. Morse entered the sales field, having been manager of several of the branch offices. More recently he was assistant sales manager.

R. B. Nuckols has been appointed sales manager of Standard Tool Co., Cleveland, manufacturers of reamers, milling cutters, taps and special tools. Mr. Nuckols has been associated with the company for 24 years as a salesman and subsequently as assistant sales manager.

Bernard R. Schneider, formerly connected with the Champlain Corp., letterpress printing equipment makers, Garfield, N. J., has joined the Chicago Pneumatic Tool Co., Hydraulic Div. in Carfield, as chief engineer.

A. N. Morton has been named production manager of the three plants of Mack Mfg. Corp., makers of motor trucks. Formerly he was factory manager of the Plainfield, N. J. plant.

H. L. Trembicki has become manager of the newly organized Wire Coating Div. of Magnus Chemical Co., Garwood, N. J. He began his career as foreign representative for a large steel manufacturer and has had wide experience in the metal-working and wire drawing industries.

Orville Noffsinger has been advanced to vice president and director of Defiance Machine Works, subsidiary of Toledo Scale Co. at Defiance, Ohio. He has been connected with the company for 28 years, advancing from apprentice machinist to sales engineer and personnel director.

Sydney Lyon has been appointed vice president in charge of production of Wilkening Mfg. Co., Philadelphia and Scranton, manufacturer of piston rings. Mr. Lyons was formerly general manager of Kellett Autogiro Corp. of Philadelphia, and previously served as production manager of the Glenn L. Martin Co., airplane manufacturer of Baltimore, and as assistant general manager of Thomas-Morse Aircraft Corp. of Buffalo. At one time he was also associated with the Army Air Force at Wright Field.

Named Vice Presidents

Sydney Lyon

Edgar C. Bain

Edgar C. Bain has been advanced to vice president in charge of research and technology of Carnegie-Illinois Steel Corp. Dr. Bain joined the research staff of United States Steel Corp. in 1928, and since 1938 has been assistant to the vice president in charge of research and technology for U. S. Steel Corp. of Delaware.

OBITUARIES

William R. Grace, 64, first vice president of Ingersoll-Rand Co., New York City, died after an illness of several weeks. Shortly after graduation from college in 1900 Mr. Grace joined the Ingersoll-Sergeant Drill Co. which made mining machinery and various types of equipment for large engineering operations. He played a prominent part in the negotiations that led to the merger with Rand Drill Co. in 1905, and became associated with the newly formed company in the world-wide development of that organization.

James A. Farrell

James A. Farrell, 80, who was formerly for 21 years president of the United States Steel Corp., passed away at his home in New York City following an illness of two months. At the age of 26 Mr. Farrell became sales manager of the Pittsburgh Wire Co. and general manager four years later. Following a merger with the American Steel & Wire Co. of New Jersey in 1899 he became foreign sales agent. Two years later, when the United States Steel Corp. was organized with American Steel & Wire as one of its principal subsidiaries, Mr. Farrell was chosen head of the foreign development division, and in 1903 he became president of the United States Steel Products Co. that was incorporated to coordinate overseas activities.

Harry Herbert De Loss, for many years vice president in charge of manufacturing of Handy & Harman, producer of metals and brazing alloys, New York City, died in Florida. He had served the company in many capacities, having been treasurer from 1905 until 1915, then vice president, and a director of the organization from 1905 until his death.

Arthur T. Knoerzer, 45, vice president and general manager of the Champion Corp., Hammond, Ind., makers of agricultural implements, passed away of a heart ailment while returning home after addressing a meeting in Chicago recently.

Charles B. Wallace, 86, head of Clark Brothers Bolt Co., Milldale, Conn., died in Southington, Conn. He had retired from the business several years ago.

MEETINGS

National Electrical Manufacturers Assn. Spring meeting. Palmer House, Chicago, Ill. April 20-23.

American Gear Manufacturers Assn. Annual meeting. Westchester Country Club, Rye, N. Y. May 17-19.

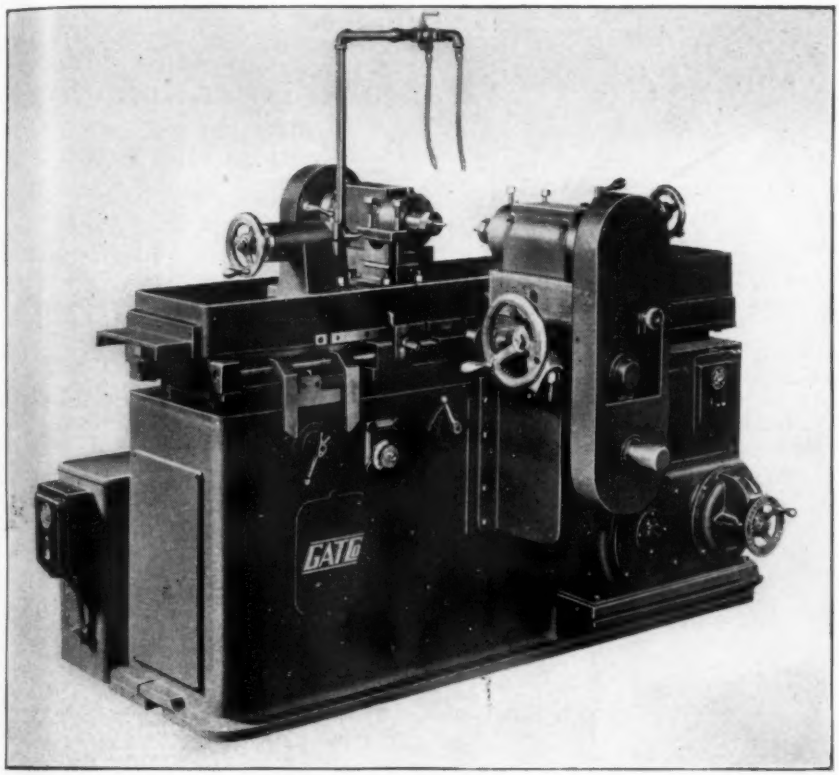
National Metal Trades Assn. Production Conference. Palmer House, Chicago, Ill. May 26-27.

American Iron and Steel Institute. Annual meeting. Waldorf-Astoria Hotel, New York, N. Y. May 27.

American Electroplaters' Society. Annual meeting. Hotel Statler, Buffalo, N. Y. June 7-9.

SHOP EQUIPMENT NEWS

Giern & Anholtt Duplex Spline and Keyway Mill Built to Accommodate Long Pieces in One Setting



For milling keyways on extremely long pieces in one setting, Giern & Anholtt Tool Co., Inc., 1308-12 Mt. Elliott Ave., Detroit, Mich., has developed a duplex spline and keyway mill. The machine has two mill heads which are located at 180 deg. from each other. These heads are fed by ratchet feed simultaneously toward one another at rates up to 0.020 per stroke. An automatic cut-out is provided for setting the depth of cut.

This keyway mill is equipped with two tables, one with an hydraulic constant-flow, vane-type pump system feed having a travel of 12 in., and locks in place by bolts after setting. The other table is adjustable for cutter location and also permits resetting of the feed table if longer or more keyways are desired. The work is located between centers and clamped in a fixture or other convenient method. Spindle speeds on this machine range from 230 to 600 r.p.m., and it accommodates cutters from 3/16 to 1 in. diameter.

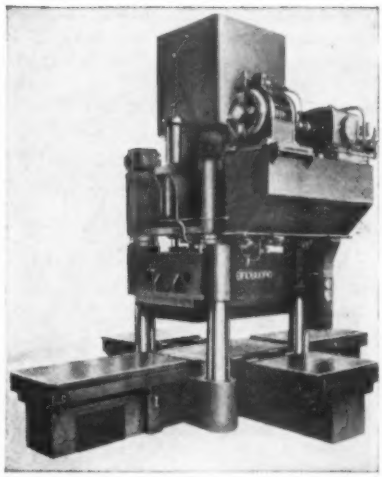
The over-all length of this model is 10 ft., with 10 in. diameter capacity and 50 in. capacity between centers. It requires floor space 4×16 ft. and weighs approximately 5,000 lb. Another model is available for 96 in. capacity between centers.

Birdsboro Airplane Press Has Four Loading Platforms

An unusual feature of the four-station airplane press brought out by Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., is the arrangement of four separate loading platforms so as to permit uninterrupted flow of aircraft parts. Tables can be provided in varying lengths to suit work requirements.

Loading and pressing operations are fully synchronized and are automatically controlled in this hydraulic rubber pad press. Elimination of starting and stopping jars is provided in the automatic speed control which keeps the work from shifting during transfer.

The table and press cycle can be interrupted instantly by the operator



anywhere around the press. Full manual control is available for set-up, tryout and special work requirements.

Rotorex Cutter Grinder Used for Variety of Tools

The Rotorex universal tool and cutter grinder, announced by Douglas Machinery Co., Inc., 150 Broadway, New York, N. Y., and made by Hunter Engineering Co., Riverside, Calif., is adaptable to a wide variety of tools such as plain milling cutters with straight or spiral teeth, side milling cutters and

face milling cutters, gear tooth cutters, gear hobs, saw blades, straight or spiral fluted reamers, counterbores and taps.

The longitudinal movement of the table is 14 in.., and cross travel is 5 in. It is equipped with an adjustable friction drag and locking device to insure proper table movement for all work pieces and reduces grinding time to a minimum. The table surface is provided with a T-slot and the top can be swiveled up to 90 deg. both ways. Markings at the right end of the table which indicate the taper in inches per foot facilitate the taper setting. For tapers in excess of these markings graduations at the center of the table around the swivel point, which indicate taper or angular movement in degrees, are used.

A handwheel in front of the grinder provides for an 8 in. vertical movement of the column and head and is graduated in 0.001 in. The spindle head carries the grinding spindle of 1¼ in. diameter. Swivel movement of the Rotorex is 105 deg. in either direction, which permits grinding any angle desired. A ½ hp. motor drives the spindle and is bolted onto an adjustable bracket on the vertical column in the base of the machine. Spindle speeds of 3,000 to 6,000 r.p.m. are provided by means of a variable-speed pulley to provide for many-purpose use.

The Rotorex grinder can be supplied either as a standard machine or as a wet grinding machine. The standard model has an 8 in. diameter swing over the table, 15 in. length between centers, and measures 26×28×56 in. over-all.

Niagara Aero Heat Exchanger Has Air Temperature Control

For cooling industrial liquids, Niagara Blower Co., 6 East 45 St., New York, N. Y., has developed a method of automatic temperature control for the Niagara Aero heat exchanger, which is based on controlling the amount of outside air passed through the evaporative cooling chamber, rather than altering the flow of liquid being cooled. The cooling effect directly proportioned to load changes gives a modulated, nearly straight-line temperature control. Water savings are increased, and when the heat exchanger is used to cool oils or compounds, there is no settling of solids, restricted flow or clogging of tubes to interrupt operations.

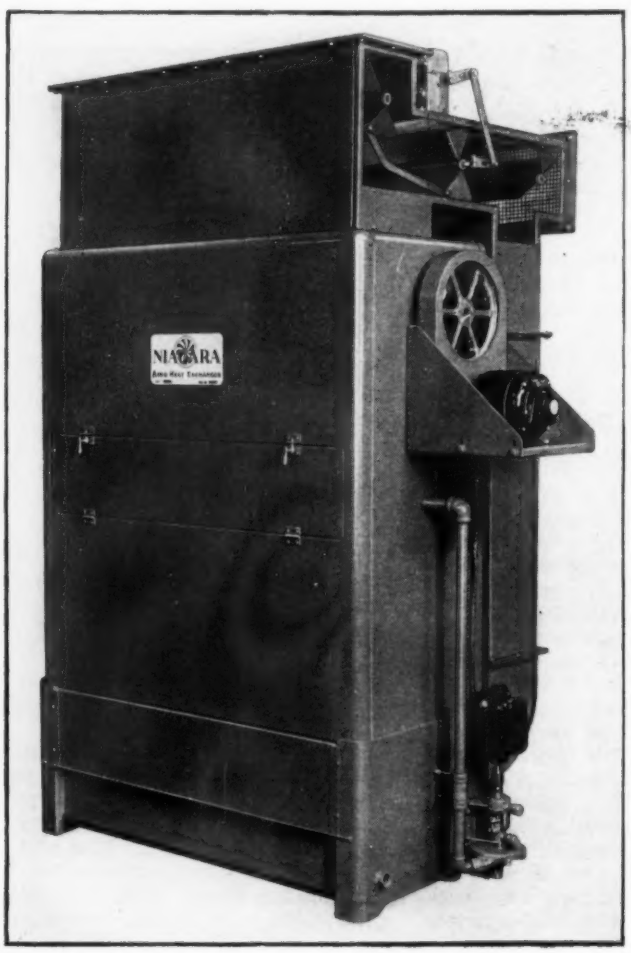
The apparatus comprises a recirculating air duct to which outside air is admitted by dampers controlled by a thermostat in the liquid line. A minimum amount of air is admitted, keeping the spray water temperature above freezing to prevent damage to the equipment in cold weather.

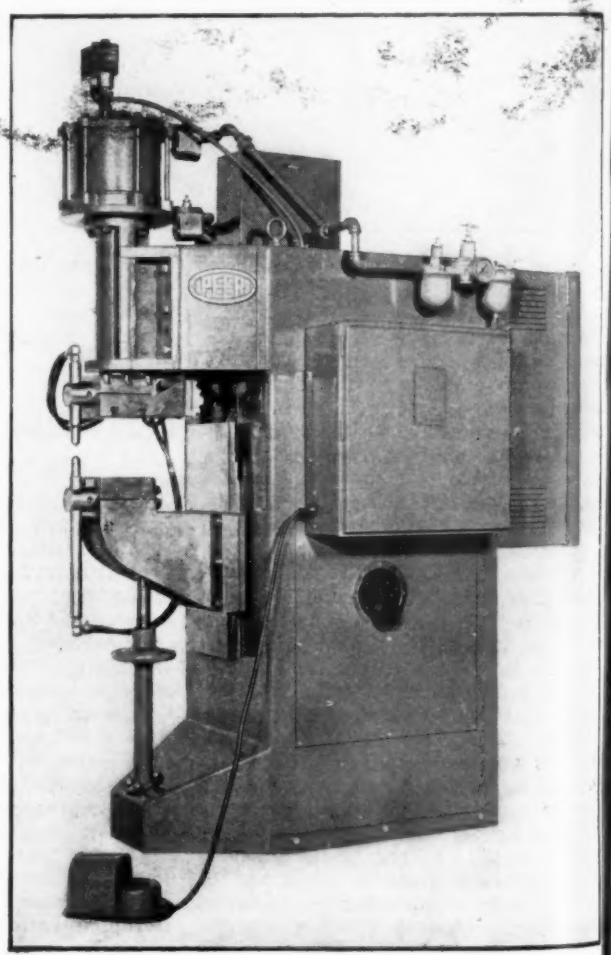
With this automatic control the heat exchanger is applied to cooling water, oils, solutions, compounds, coolants, chemicals and process materials in such fields as heat-treat quenching, wire drawing, cutting, grinding and machining coolants.

Pier Makes Air-Operated Projection and Spot-Welders

Series P-50 and P-100 automatic air-operated press type projection and spotwelders have been added to the electric welder line of Pier Equipment Manufacturing Co., Benton Harbor, Mich. These welders are designed for high-speed precision projection and general spot resistance welding of sheet and structural steel assemblies, wire and non-ferrous metals.

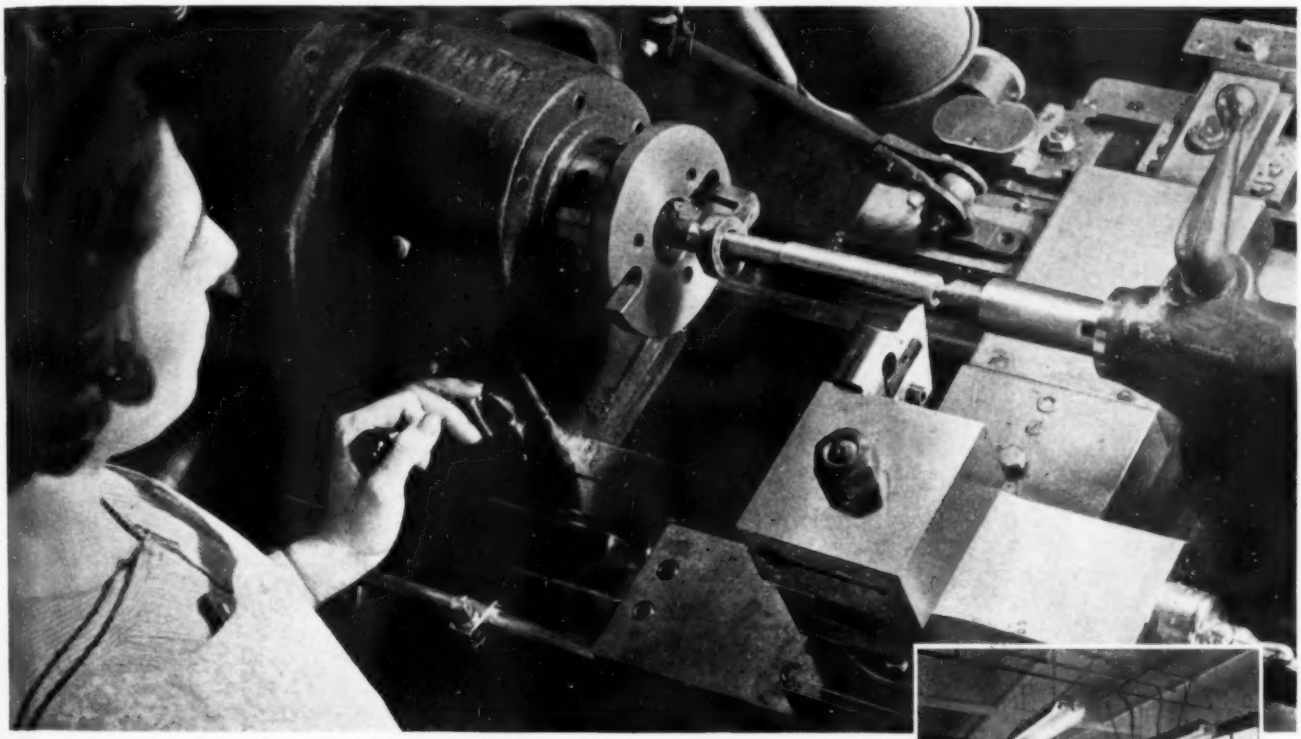
The Series P-50 is made in two transformer capacities, 30 and 50 kva. while the P-100 is available in 75, 100 and 150 kva. The P-50's are supplied with either 4- or 5-in. cylinders, and with





New Operators

TRAINED QUICKLY FOR HIGH PRECISION WORK

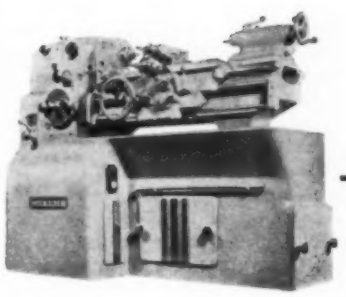


Chasing thread gage laps is one of the most accurate operations in gage work, yet within a few weeks after installing their first machine in this department, The Taft-Peirce Manufacturing Company of Woonsocket, R. I., is operating its entire battery of 16 Monarch Sensitive Precision Lathes with previously untrained help. In spite of this seemingly short training period, production rate is high, accuracy well within required tolerances, and the number of rejects surprisingly low.

To maintain production, the first Monarchs delivered were manned by experienced workers. One by one, new operators were carefully trained, and now have released these skilled men for other work.

This is one of many examples which prove the utility of Monarch Lathes. Simple and easy operation allows immediate production of many repetitive jobs by previously unskilled operators. Accuracy is so much a basic part of Monarch Lathe design that neither quality of work nor production rate suffers by such emergency measures.

Further—this is additional proof that even under present production pressure, there is no letdown in Monarch quality.



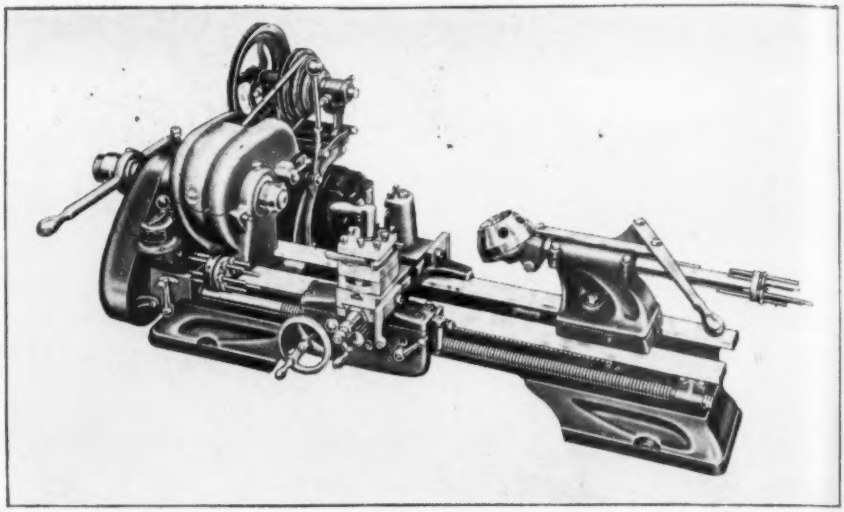
THE MONARCH MACHINE TOOL COMPANY · · · SIDNEY · OHIO

MONARCH LATHES

COVER THE TURNING FIELD

6 and 8 in. cylinders for the other model. NEMA Types 1, 2 and 3 controls of welding timing and sequence are available.

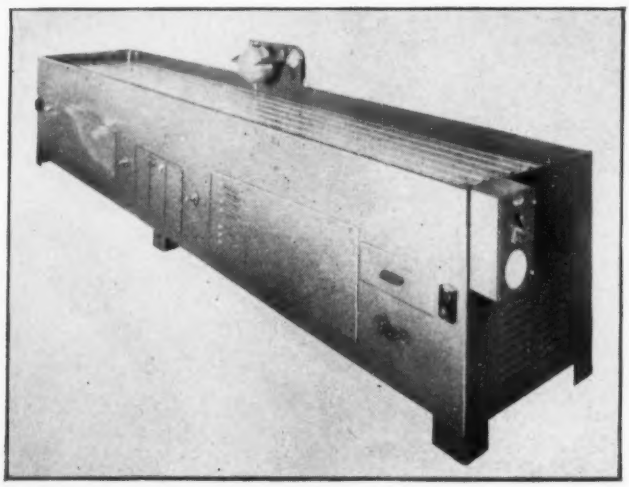
These welders are equipped with double-acting air cylinder and control valves for smooth, speed action. Pressures depend upon the size of the cylinders and range from 800 to 4,000 lb., adjustable by means of a regulating valve. Die platens with T-slots hold the projection welding dies, while for spot-welding operation, each machine is supplied with two 2½ in. diameter by 8 in. copper horns machined to accommodate 1¼-in. water-cooled electrode holders either at right angles or in offset position. Throat depths are 12 and 24 in.

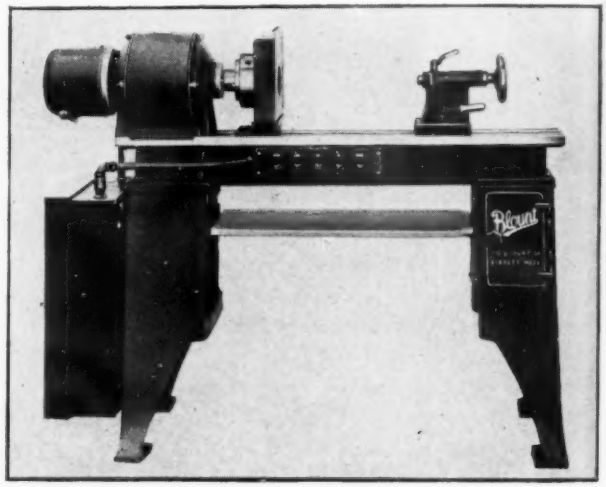


Atlas Lathe Can Be Converted To Hand-Type Screw Machine

The Atlas F-series 10-in. lathe made by Atlas Press Co., Kalamazoo, Mich., may be converted into a hand-type screw machine for rapid production of small precision parts by addition of independent or universal chucks. This machine has a 10¼ in. swing over bed, collet capacity of ½ in., and 16 spindle speeds between 28 and 2,072 r.p.m. The thread cutting range is from 4 to 96, right and left. Four bed lengths are available, with capacity of 18 to 36 in. between centers.

This screw machine has a lever-type collet chuck, carriage turret with four-way toolposts which take ⅝ in. cutter bits, and back-slide toolposts. The tailstock turret head has six ¾ in. bored holes for toolholders. The machine has a multi-stop attachment for gaging the length of the cut, and is also equipped with a reversing switch and spindle nose cap. The lathe has reversible power cross feed and longitudinal feed, complete V-belt drive, and tapered roller spindle bearings.





Hydraulic Test Bench Checks Aircraft Tubing

The Model T-102 stationary test bench produced by Hydraulic Machinery Co., Inc., 10421 Grand River, Detroit, Mich., is suited principally for checking aircraft tubing, and can be used by two operators at a time. In emergency a third operator can work from the accumulator hook-up. This bench has a variable test pressure up to 10,000 lb. per sq.in., and a variable delivery pumping unit to 12 gal. per min.

The accumulator is used for checking aircraft valves and operates at a maximum test pressure of 1,000 lb. per sq.in. This is a totally inclosed air-oil unit. The air part is charged by a small high-pressure air compressor.

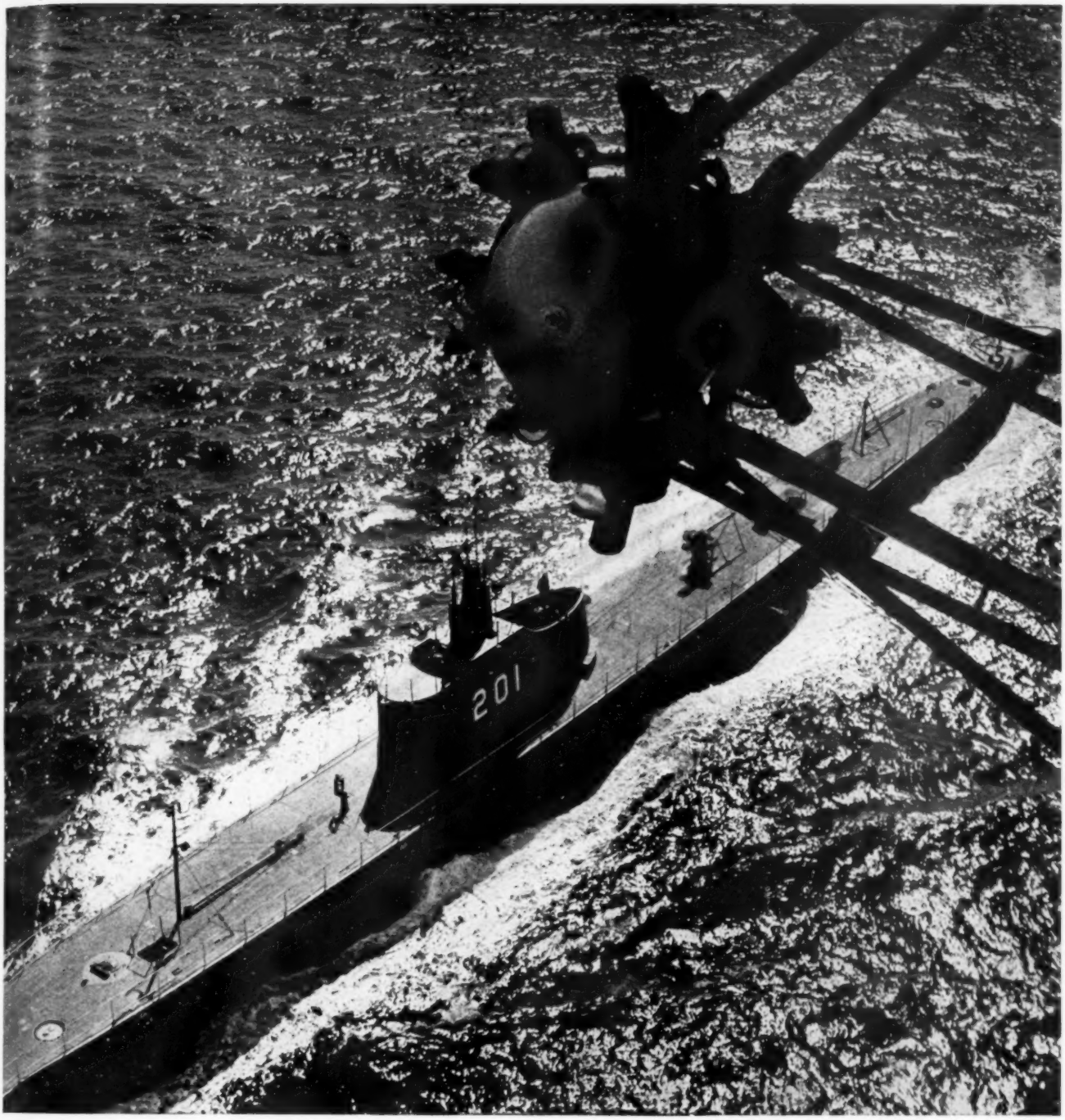
All of the controls of the test bench are easily accessible from the outside. This unit can also be used to check other aircraft equipment before its assembly.

Blount Motor Headstock Lathe Has Automatic Stopping Brake

The Model B-2 ball bearing motor headstock type lathe, has been introduced by J. G. Blount Co., Everett, Mass. It is equipped with the latest type selective speed pushbutton control, including magnetic contact panel. An automatic electric solenoid brake is provided for quick stopping, and includes manual spindle release.

The machine has 12 in. swing by 4 ft. bed. It has a ½ hp. motor at 600, 1,200, 1,800 and 3,600 r.p.m.; and can also be furnished in ¾ hp., 300, 450, 600 and 900 r.p.m., for 16 and 18 in. swing. This model is furnished with a chuck guard including six adapter plates or slides, having various hole diameters to suit conditions. The spindle nose is 1⅛ in. diameter, 10 V threads on the B-2 lathe, with 3,600 r.p.m. The weight of this machine is 830 lb.

The B-1 lathe has a 1½ in. diameter spindle nose, 10 V thread and operates at a speed of 1,800 r.p.m. Six-inch chucks are recommended for both types. The spindles are usually made solid on both lathes, operating at 1,800 r.p.m. when they are used for chucking operations.



OFFICIAL U. S. NAVY PHOTOGRAPH FROM HAROLD M. LAMBERT

Poison . . . and antidote

Each weapon in war has its match, or foil.

Sub and blimp. Tank and tank-buster. Minelayer and minesweeper. Aircraft and A. A. gun.

Yet they all have one thing in common. Being mobile mechanisms, they operate with revolving shafts and gears that turn on *anti-friction* bearings. Without such bearings there could be no ease of movement, no "fluid" flow of power, no *sustained* performance. Friction would freeze motion.

And since "nothing rolls like a ball," engineers use New Departure ball bearings for thousands of installations ranging from tiny precision instruments to the transmissions of mighty tanks—as well as for the machines that make them.

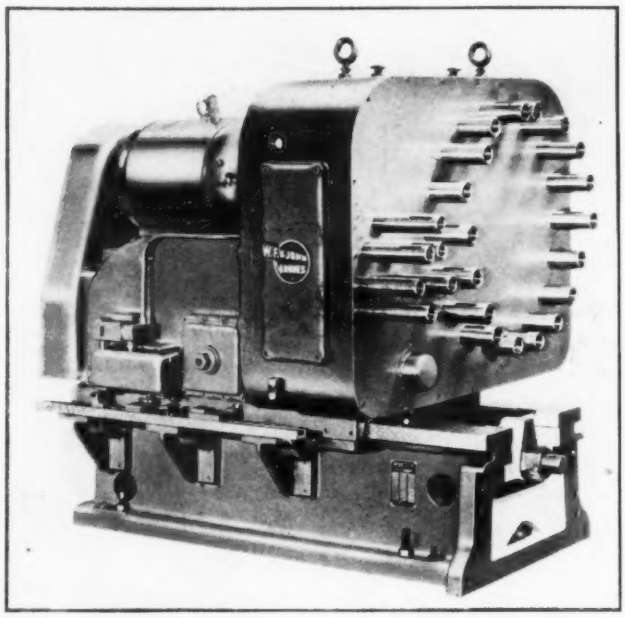
New Departure is making bearings by the millions. In fact New Departure has a major responsibility in the whole ball bearing war production program.

And we are looking forward to the day when these ball bearings will again be available for peacetime purposes in even higher quality because of the lessons of wartime production.

3158

New Departure
THE FORGED STEEL BEARING

Barnes Standard Drilling Unit Equipped to Drill Tank Turret



Standard hydraulically actuated drilling units made by W. F. & John Barnes Co., Rockford, Ill., have been equipped with special multi-spindle heads for the drilling of the 360 deg. revolving turret on the M-4 medium tank.

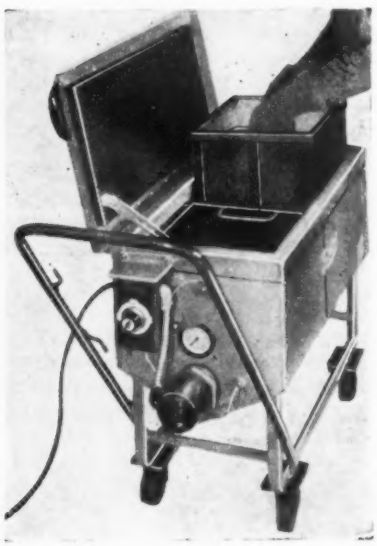
One unit has 24 spindles and the other has 25 spindles. Those on the 24-spindle head are arranged with 18 spindles equally spaced about a circle and 6 spindles in a cluster. Both heads are equipped with hardened alloy steel gears, anti-friction bearings and heat-treated spindles and shafts.

Aeroil Dipmaster Dipping Tank Made for Cleaning Metal Parts

The Dipmaster, Jr., a portable, insulated electrically heated dipping tank for cleaning and degreasing of metal parts, has been announced by Aeroil Burner Co., Inc., Park Ave. at 57 St., West New York, N. J. The heating element is located inside on the bottom of the tank where it is completely submerged. Average heating time from a cold start to boiling point is 1¼ hr. This heating element can be removed whenever any cold solutions are used.

Two dipping baskets are included with the tank, each measuring 11¾ × 11¾ in., and 8 in. deep. It is equipped with a bi-metal type thermometer control of the shockproof type with a dial and knob for shutting off the heating element manually, and to maintain automatically any desired temperature between 100 to 550 F. The tank is fitted with an extension cord and operates on 110 or 220 volts alternating or direct current. The steel tank is insulated all around the inner shell in order to reduce heat loss to a minimum and enable quicker starting. An insulated cover with handle has a bracket to hold it in open position when the tank is being loaded or unloaded.

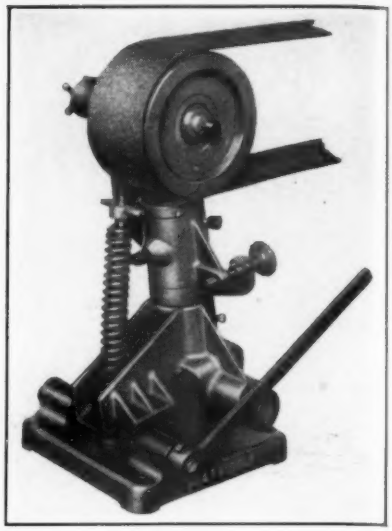
Larger stationary models of the Dipmaster Jr. are available, ranging up to 600 gal. capacity, heated by kerosene, city or liquified gases, with removable immersion tubing units in the tank so that the heat is delivered in the liquids as it is with the electrically heated tanks. Maximum capacity of this unit is 15 gal.



Mattison Belt Idler Stand Permits Grinding on Belt

The No. J-135 abrasive belt idler stand and pulley introduced by Mattison Machine Works, Rockford, Ill., is used to convert the regular grinding and polishing lathe to the use of factory-coated abrasive belts. The stand is placed at the rear of the lathe, permitting the use of an abrasive belt running over a contact roll or wheel on the lathe and traveling back around the idler pulley. Grinding is done on the belt instead of the set-up wheel with this arrangement.

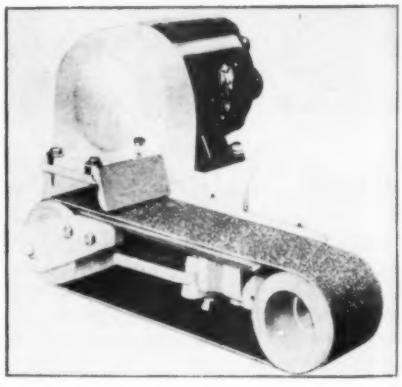
A ball bearing idler pulley is mounted on the yoke which can be swiveled by handwheel to align the pulley with the belt. For controlling the position of belt on the pulleys, handwheel adjustment is provided. A cam arrangement makes it easy to change the belt.



The entire assembly swings on a hinge shaft mounted on the base. Slack in the abrasive belt is automatically taken up by sensitive spring tension. The spring is adjustable to suit various types of work. The stand is also adjustable for either right- or left-hand by turning the column and upper assembly halfway around.

Walls Abrasive Band Grinder Is Suited for Bench Mounting

The D-4 bench type abrasive band grinder has been introduced by Walls Sales Corp., 96 Warren St., New York, N. Y. It is powered by a 1/3 hp. motor with a fully inclosed V-belt drive. The band measures 4 × 36¼ in., and the table 4½ × 9 in. This machine is equipped with Alemite lubricating system, and has ball bearings throughout.

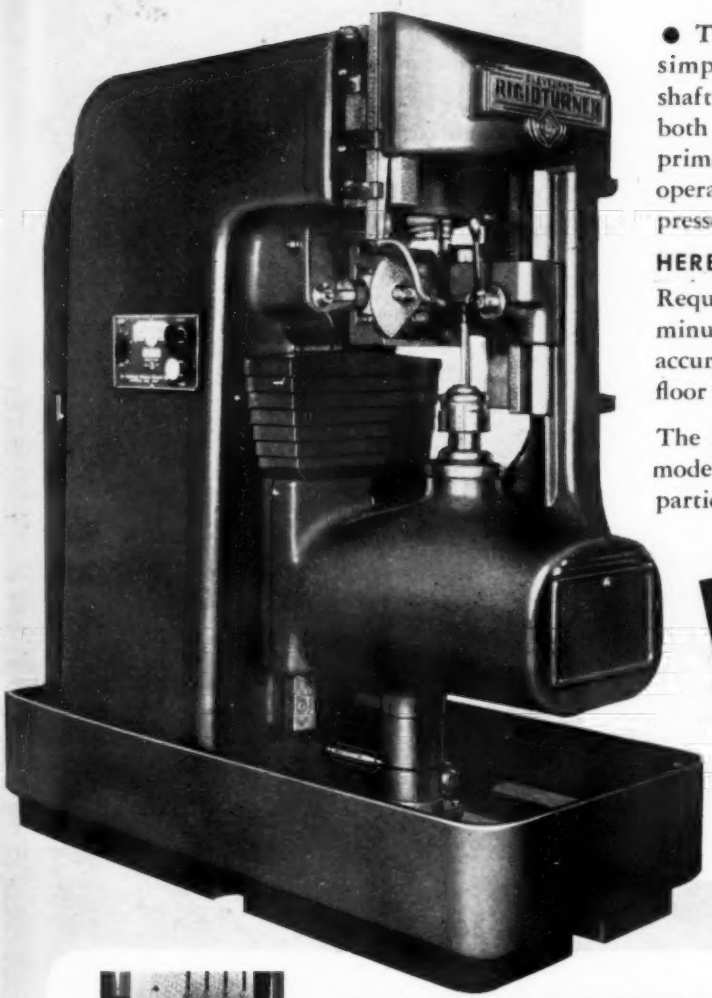


Wilberton Surface-Angle Plate Makes Inspection Easier

A combination surface-angle plate in bench or floor model made by Thomas Wilberton & Co., Cedar Grove, N. J., enables easier inspection on production operations. It is claimed to check ac-

The RIGIDTURNER

for High Production and Uniform Accuracy of Multiple Diameter Operations



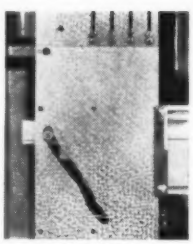
● The Rigidturner is a sturdy machine of simple design—adaptable to any type of shaft turning. It is speedy and economical both on short and long runs. This is due primarily to ease of set-up and automatic operation. Operator merely loads work and presses button.

HERE ARE A FEW OF ITS ADVANTAGES

Requires no skilled help—more operating minutes per hour—less change over time—accurate duplication—longer cutter life—less floor space—greater production at lower cost.

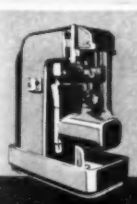
The Rigidturner is also built in 8-spindle model for long runs of duplicate work where particularly high production is desired.

WRITE for fully descriptive bulletin which tells how machine increases production . . . provides longer tool life . . . maintains accuracy.

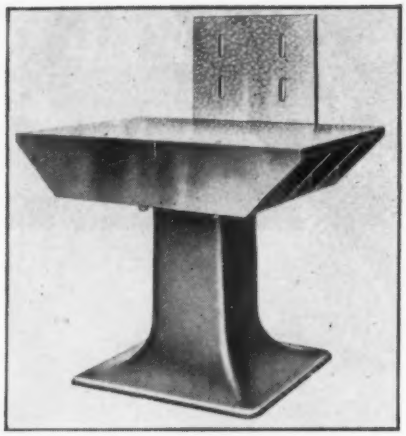


⬅ CAM CONTROLS CUTTER ROTATION

The rotation of the cutter is controlled by a cam by means of a follower attached to a rack meshing with a gear on the work spindle. The cam is fixed to the work head thus the cutter must always be in correct relation with the part. Dowel hold the cams in fixed relation to the work head.



The CLEVELAND HOBBING
Cleveland ... MACHINE Company ... Ohio
BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS



curacy on both surfaces and angles within tolerances as close as 0.00005.

Freedom of action during inspection is made possible by the unobstructed clearance for the handling of the work. The floor model is equipped with a pedestal and weighs 2,300 lb. Angle plate measurement is 18×19 in., surface plate 24×36 in. The bench type weighs 145 lb., angle plate size being 10×10 in., surface plate 14×18 in.

Aero Bucker for Sheet Metal Bucks, Rivets Simultaneously

Bucking and riveting can be done simultaneously with the automatic bucker featured by Aero Tool Co., Burbank, Calif., used for riveting airplane and other sheet metal parts. The tool

is made for use with any standard rivet gun, but can be furnished with specially designed heads for any type of aircraft construction.

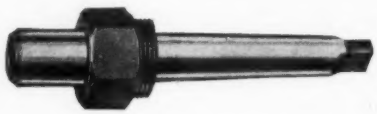
Parallel yokes provide for side panels, wings and leading edges, with special yokes for engine cowling and other parts that require extra clearance. On vertical structures the rivets can be inserted in the usual manner, or preloaded and taped; and on horizontal structures the rivets can be preloaded. Opening and travel of the bucking bar are limited only by the accessibility of the part to be riveted.

This automatic bucker weighs 14 lb. with the 22 in. throat, and 16 lb. with the 36 in. throat, including the gun.

Erickson Collet Chuck Is Open Slotted at Both Ends

The 01 Model collet chuck offered by Erickson Steel Co., 2309 Hamilton Ave., Cleveland, Ohio, features a collet which is open slotted at both ends, thus allowing the collet to collapse equally throughout its length. The work is held in a vise-like grip. Shanks are available for any type spindle, external or internal.

The construction of the shank makes this collet chuck adaptable for any type of machine or set-up. The eight-point grip of the collet on the tool



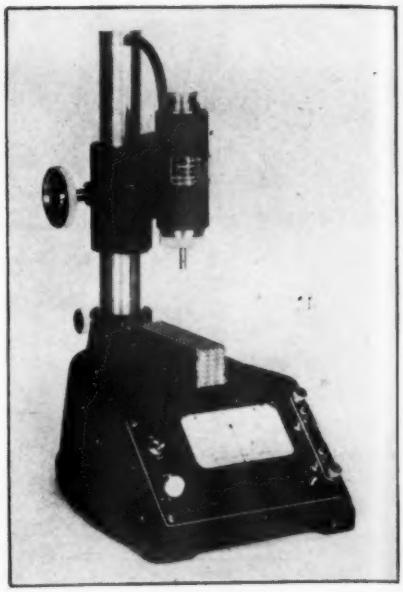
shank permits heavier feeds without vibration or loosening. It is said that the collet is capable of collapsing at least 1/32 in. and still maintain its grip and accuracy.

Improvements in this model include a single locknut method for tightening, and other refinements in design have been made to lessen the hazard of breakage of the chuck. The use of broken drills is permitted as it holds on the flutes as well as on the shank. This chuck can be used for either single or double ended end mills, which eliminates the need for special end mill holders.

Metron Comparator Gage Has Four Sensitivity Ranges

A four-range electric comparator gage for rapid comparison of close-tolerance machined parts, for selective sorting of machined parts, for measuring taper and out-of-roundness, and for measuring shop tools and gages for accuracy and wear, is offered by Metron Instrument Co., 432 Lincoln St., Denver, Colo. The four ranges of sensitivity include ±0.0002, ±0.0004, ±0.002 and ±0.004. The scale is marked for measurement from 0.00001 to 0.004 in. The four ranges provide magnification of 10,000, 5,000, 1,000 and 500 respectively. The spindle pressure, variable from 2 oz. to 2 lb. by rotation of a knob, remains constant throughout all ranges after setting.

The gage head swivels around the column and tilts at any angle to the vertical. This angle is indicated on a protractor. Three size adjustments are

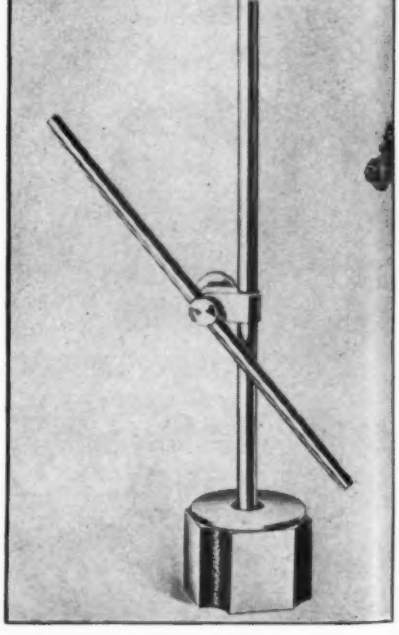


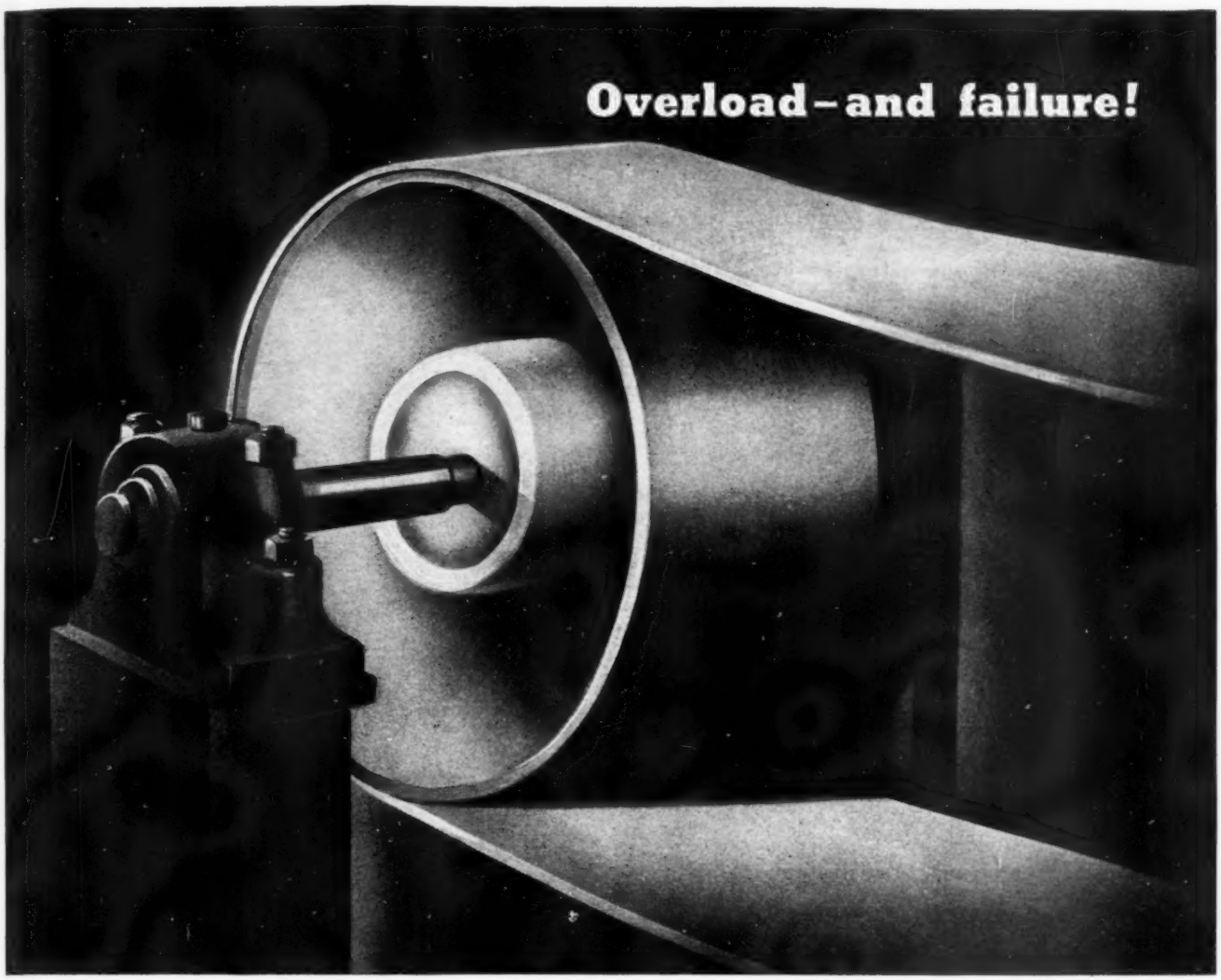
provided on the gage, a rack and pinion elevating mechanism, a vernier adjusting collar on the gage head, and the electrical zero adjustment on the indicating unit for hairline zero setting. For use in special set-ups, or in multiple gage fixtures, the gage head and indicating unit are removable from the stand. When used in this manner, the knurled collar at the bottom of the gage head serves as a vernier size adjustment.

Special scales with higher magnifications and wider ranges can be provided, also metric scales.

Windemere Magnetic Adapter Has Streamlined Features

Windermere Manufacturing Co., Inc., 205 East 42 St., New York, N. Y. has produced a streamlined magnetic





Information supplied by an Industrial Publication

Recent tests by a well-known rubber company prove that as little as three pounds extra tension on power transmission belting, above recommended tension, will shorten its life as much as 68 percent!

In the tests three grades of the present wartime construction of transmission belting were used. Each belt was run at 15 pounds per inch per ply, a 720 pound total for the tension, the recommended figure, and at 18 pounds per inch per ply, a total of 864 pounds tension, on 4 inch diameter pulleys. Belts were all 6 inches wide, 30 feet long, spliced in 10 foot endless lengths. Tests were all highly accelerated.

Belt No. 1 ran for 95 hours before breakdown under the 19 pound tension, and increased its life to 230 hours before failure when the tension was 15 pounds.

Belt No. 2 ran for 88 hours at the 18 pound tension, and for 263 hours before failure at 15 pounds.

Belt No. 3 ran for 15 hours under 18 pound tension, and the service life before failure jumped to 48 hours under the 15 pound tension.

Close attention to "details" like this will save costly shut-downs and increase productive man-hours. This is just another case of designing to meet requirements — another important conservation measure.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Mo-lyb-den-um Company
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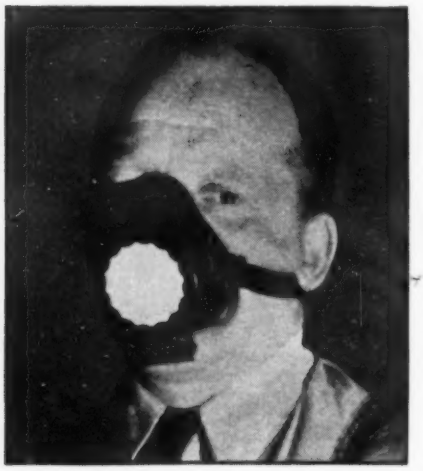
MOLY

adapter for dial test indicators, gage block applications and surface gages. The adapter is transformed from an indicator holder to a general work holding block to anchor angle iron, parallel and work pieces in any given position by removing the upright. This is made possible because magnetic qualities are the same at the bottom and top. This adapter is available in one standard size, weighing about 20 oz., with upright center post ⅜ or $\frac{5}{16}$ in. Clamps are also available for holding the indicator.

American Optical Respirator Has Air-Filtering Cartridge

An air-filtering cartridge has been developed by American Optical Co., Southbridge, Mass., for its R-1000 respirator. This Type AD cartridge protects lungs against a combination of all



types of dusts, including toxic, pneumoconiosis-producing dusts.

A compartment in the face piece of the respirator holds the cartridge in place. Cartridges have been made to take care of seven different types of dusts, fumes, vapors, and gases.

Dension Portable Test Stand Checks Plane Hydraulic System

To test the hydraulic systems of airplanes and component parts, Denison Engineering Co., West Chestnut St., Columbus, Ohio, has introduced a portable motor-driven test stand. It will check the entire hydraulic system, including valves and lines of aircraft operating on pressures up to and including 3,000 lb. per sq.in. The stand is driven by a 7½ hp., 1,200 r.p.m., 3 phase, 220 volt, constant speed motor. Fluid is supplied from either the airplane or tester reservoir. Working pressures of the tester are adjustable over a range of 500 to 3,000 lb. per sq.in.

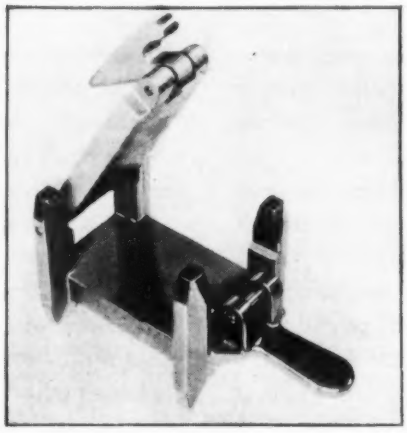
The completely inclosed stand has a welded steel frame mounted on casters and supplied with a pulling tongue. All instruments and control valves are

mounted on the front panel. The oil-level gage is mounted on the top of the stand.

The suction and pressure lines of the airplane's hydraulic system are disconnected from the pump and connected to the test stand. The volume of flow is adjusted to any desired point between 0. and 3.2 gal. per min., and the relief valve is set at a higher pressure than the hydraulic system's relief valve. The hydraulic system of the plane is then tested and operated in the same manner as under flight conditions.

Parlec Universal Drill Jig Has Quick-Locking Device

A basic drill jig unit, known as the Parlec universal drill jig, has been introduced by Earl C. Parkhurst, 751 E. Stepney Place, Inglewood, Calif., to help speed tool production. It is con-



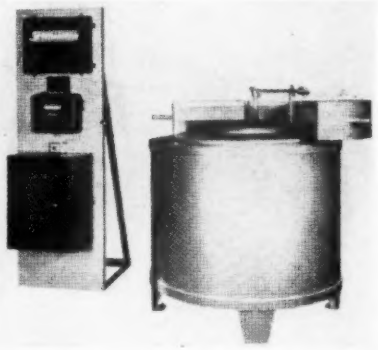
structed of cast nickel iron and normalized, having top, bottom and sides of the jig frame and cover finished. It has only three castings and four pins, and a special quick-opening and locking device that also acts as a handle during drilling.

Seven sizes of jigs are available, covering 1½×2, 3×3½, 3½×5¾, 6×6, 5×10, 1½×6, and 3×11 in. Master layouts are furnished with each size, which when placed under the tool or part designer's drawing, will quickly determine the size jig needed.

Swoboda Salt Bath Furnace Has Throttling-Type Controls

The Falcon high temperature salt bath furnace for cyanide hardening of tool steel products has been introduced by H. O. Swoboda, Inc., 147 Thirteenth St., New Brighton, Pa. It is also suitable for regular thermal hardening. The furnace is provided with throttling-type automatic controls, including a potentiometer-type control pyrometer with an input regulator, and also has a contactor for carrying the furnace load. Maximum operating temperature is 1,650 F.; controls permit operation at low temperatures for tempering.

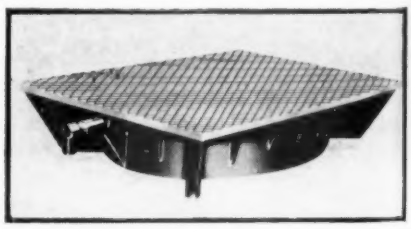
The casing of the furnace is steel and an alloy pot is suspended from the casing into the furnace chamber by means of a heavy cast intermediate ring. The pot measures 16 in. inside dia. by 18 in. deep. Brick and block



type heat insulation is used throughout. The cover is hinged and swinging type. Capacity of the unit is 30 kw., 220 volts, single phase current, but may also be connected for use on three-phase current.

Smith Precision Lapping Plate Built With Elliptical Ribs

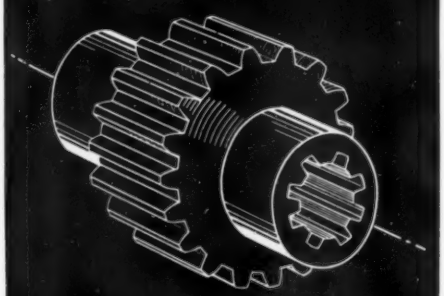
Smith Tool & Engineering Co., 802 North Sandusky Ave., Bucyrus, Ohio, has brought out a precision lapping plate for developing a true plane to close tolerances when lapping metal-to-metal joints. These plates incorporate elliptical rib construction to give maxi-



mum rigidity and a minimum of deflection. These plates are precision lapped to a final flat surface and grooved at an angle. As these angle grooves cross each other a series of diamond shape, flat areas are formed. Sizes range from 8×12 in. to 48×120.

RECOMMENDED PROCEDURE

1. MACHINE END FACE
2. DRILL HOLE
3. BROACH HOLE
4. FINISH END FACE AND CONTOUR LOCATING FROM BROACHED HOLE



COMMON PROCEDURE

1. MACHINE END FACE
2. DRILL HOLE
3. MACHINE CONTOUR LOCATING FROM DRILLED HOLE
4. BROACH HOLE

How to get more accuracy by Broaching

5. BY PROPER MACHINING SEQUENCE.

THE drawing used at the left illustrates a broaching principle.

To get the most out of broaching—don't expect a broach to correct eccentricities or lack of squareness created by previous machining sequence. Broach your holes and surfaces FIRST and then use these surfaces to locate from.

This is one of the "Do's and Don't's on Broaching" available in printed form in bulletin board size. Write for a copy today. Ask for Bulletin No. 274.

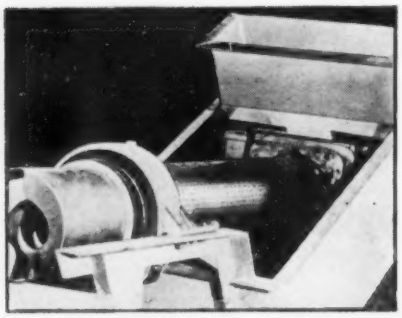
colonial BROACH COMPANY

Broaching Machines — *Broaches-Broaching Equipment*

DETROIT . . . . . U. S. A.

Salem Spiralveyor Unit Removes Parts From Quench

A Spiralveyor has been developed by Salem Engineering Co., Salem, Ohio, which is used for removing quantities of heat-treated parts from the quench



to a pickling unit at the rate of 8,000 lb. per hr. The unit is an inclined 18 in. diameter, perforated steel tube through which a spiral conveyor screw operates and carries the parts up through the tube and out of the quench. The wall of the tube is perforated with 9 32 in. holes and all the water is tumbled out of the components, thereby allowing the part to enter the pickling solution without diluting the bath with water from the quench.

Kleer-Flo Parts Cleaner Features Fire Safety Link

The Kleer-Flo mechanical parts cleaner for shop use, introduced by Practical Products Co., 1629 University Ave., St. Paul, Minn., features a safety link in the cover in case of fire. The cover closes and locks automatically when temperature rises to more than 160 F. This Model KS-20 parts cleaner uses any standard solvent. The cabinet and base are two separate units. Semi-rigid hose which is made of galvanized steel will stay in any position in which it is placed. A steady flow of the solvent at moderate pressure prevents splashing on the operator. The working tray on which parts are cleaned is so constructed that the solvent can readily drain without loss of the smallest parts.

The cleaner is equipped with casters for moving to any part of the shop. It measures 24×36 in., and has capacity of 20 gal.

LARCO Plus Five Diamond Tool Can Be Reset by the Operator

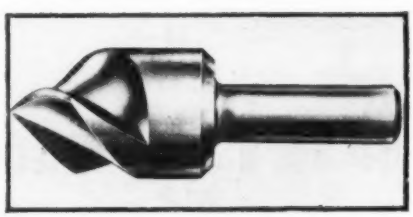
The LARCO Plus Five diamond tool made by Louis A. Roselaar, LARCO Tool Div., 551 Fifth Ave., New York, N. Y., has been designed so that the operator can reset the point of the

diamond himself; and is made so that on any of the six interchanges of point the octahedron diamond is always in dead-center. The tool is available with either one cap for a specified size diamond, or with several caps to take several sizes.

Womens' StaSafe Hairgard Is Adjustable to Head Size

Protection for women workers' hair is provided by the StaSafe Hairgard made available by Standard Safety Equipment Co., 232 W. Ontario St., Chicago, Ill. They are available in four styles, and have the appearance of a cap. Colorful combinations can be selected from navy blue or ivory drill with red, green, blue or white trim on the crown and visor. All models are adjustable to any head size by either elastic or draw string.

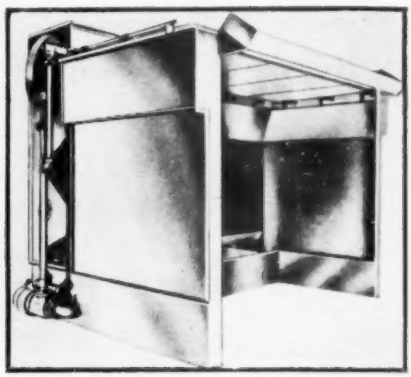
Schrillo Makes Spiral Fluted Countersinks and Counterbores



The design of the spiral fluted countersink and counterbore brought out by Schrillo Aero Tool Engineering Co., Los Angeles, Calif., permits repeated resharpening of the countersinks without sacrifice of cutting efficiency. It is said the hardened and ground shanks of both countersinks and counterbores are unaffected by chucks or wear.

Mayer Paint Spray Booth Employs Water Wash Method

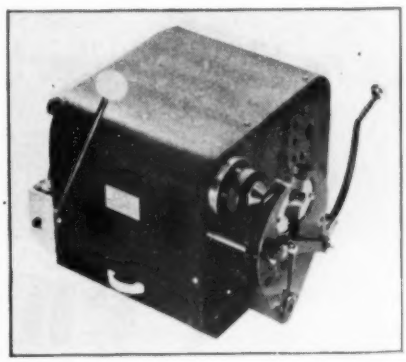
The Type FLRS-7 floor-type paint spray booth made by Mayer Manufacturing Corp., Aqua-Restor Div., 56 Division Place, Brooklyn, N. Y., employs water-wash cleaning for larger parts finishing. This equipment features rear and side water-impingement walls, and employs the company's superturbulent



chamber. In operation the side and rear walls are continuously covered with a sheet of water which is completely controlled. Because of this method of air cleaning, no spray nozzles or moving parts are required, thus reducing work stoppages for servicing. The unit is equipped for fluorescent lighting.

Leonard Universal Tube Master Squares, Burrs, Beads Tubing

A machine called the Tube Master that squares, burrs, flares, and beads ferrous and non-ferrous tubing is offered by Leonard Precision Products Co., 1100



Larson Ave., Garden Grove, Calif. It is a small, compact unit which sets on any bench. Tube sizes from 3/16 to 1½ in. can be handled with this model. Ten sets of flaring dies with necessary

By doing many things a little faster, J&L is producing more steel for war

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FROM AN ORIGINAL DRAWING BY ORISON MACPHERSON

TEAMWORK POURING STEEL BACKS UP OUR FIGHTING MEN

America's steel mills today are producing steel for war at the all-time high rate of 95 million tons a year. This averages enough steel in one second's time to make four jeeps —a dozen gun-shields.

In the illustration you see a skilled crew pouring molten steel into man-high molds to become ingots — unit measure of steel production — steel in its first solid form. The men on the platforms and the cranemen maneuvering the huge ladles from aloft, make up real All-American teams, typical of those all along the steel front of 650,000 workers who are employing all their skill and teamplay to make every second count against the enemy and toward saving American lives on the battle fronts.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

J&L STEEL

CONTROLLED QUALITY STEEL FOR WAR

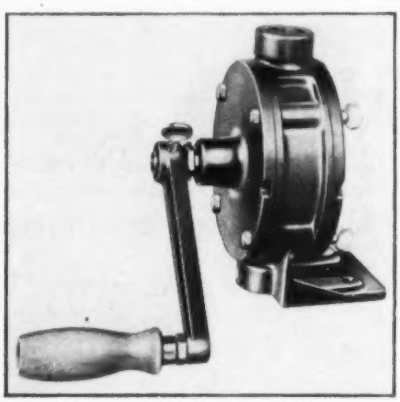
centers and one squaring and burring attachment are standard equipment of the Tube Master.

The machine is set for the desired flare size by turning the indicator or hub of the flaring center. An automatic finger stops the tube at exactly the right position in the machine. The interchangeable dies, flaring centers and tool heads are quickly changed with a flip of the finger. All dies and tools are immediately available in the self-contained tool compartment of the machine. Operating speeds and thrusts are controlled by a lever which provides safety for the operator.

Models available are equipped with 1/3 hp. single phase, 50-60 cycle, ball bearing motor which operates on 110 volts; or one with 3-phase, motor which operates on 220 or 440 volts, equipped with a fractional hp. manual controlled switch. Another model is equipped with pneumatically-operated jaws which require the use of only one lever to complete the operation cycle. An improved design of this model is available equipped with a 2-speed spindle. This spindle permits squaring and burring of ferrous, as well as non-ferrous tubing.

Blackmer Rotary Hand Pump Fitted With Offset Flange

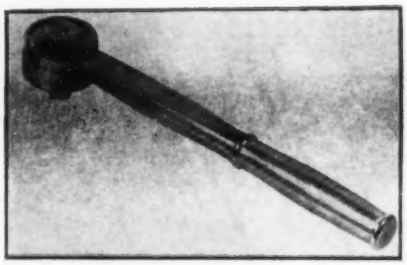
A rotary hand pump has been made available by Blackmer Pump Co., Grand Rapids, Mich. The base is fitted with an offset flange for mounting on the



edge of a flat surface, such as the top of a tank, vat or other container, with ample clearance for free operation of the crank. The basic design of the hand pump follows the sliding vane principle. Intake and discharge ports are 1 in. with threading for standard pipe or hose connection.

Wedge-Lock Socket Wrench Features Immovable Lock

The Wedge-Lock socket wrench has been announced by F & H Manufacturing Co., 2207 W. Jefferson St., Los Angeles, Calif. Two hardened-steel



free-moving shoes serve as an instantaneous acting clutch. The wrench is immovably locked for the tightening pull at the point that the handle comes to a stop on the back swing. Handle movement of $\frac{1}{16}$ in. or less is suited for close quarter operation. The minimum return motion before engaging is 1.2 deg. clockwise and counterclockwise. This wrench is available in sizes of $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{3}{4}$ in.

Johnson War-Formula Paint Replaces Wax-Fortified Line

Developed for wartime use, the War-Formula paint introduced by S. C. Johnson & Son, Inc., Industrial Maintenance Div., Racine, Wis., replaces the wax-fortified paint recently announced. It is said that all advantages found in the wax-fortified paint have been retained, with the exception that the new line is not wax-impregnated. No special care or preparation is required in application. This paint may be brushed or sprayed on. It is available in flat or enamel finish, and in a wide variety of colors including machine tool gray.

Steel-Grip Leather Gauntlet Is Steel Ribbon Reinforced

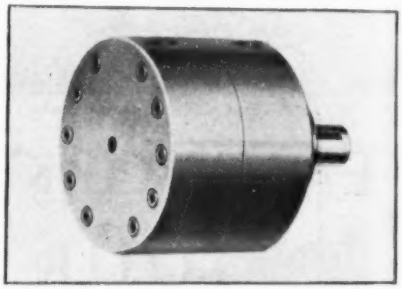
Industrial Gloves Co., Danville, Ill., has available a Steel-Grip glove for women workers which is gauntlet style and made of chrome tanned leather, reinforced on all wearing surfaces with steel ribbons which are diagonally placed

for greater protection against cuts and snags. The seams are sewed with steel thread, and the thumb wearing surface, as well as the junction of palm and thumb are reinforced with extra leather and steel ribbons. If desired, this glove may be obtained with a 2-in. band instead of gauntlet.

Hydra-Motive Dual Vane Pumps Suit High Pressure Operation

Hydra-Motive Division, 723 East Milwaukee Ave., Detroit, Mich., has developed a constant delivery, hydraulic oil vane type pump in three sizes, suited especially for high pressure operation. The unit is of dual vane design which permits operation under high pressures without overheating and with reduction in wear. The maximum continuous operating pressure of this pump is 1,250 lb. per sq.in., but pumps are also available for operation at higher pressures. Pressures as high as 2,000 lb. per sq.in. can be handled by the pumps for prolonged periods.

Instead of a single vane in each vane slot, two vanes are used. Each of these is ground with a bevel so that oil under full operating pressure



can reach the outward edge of each pair of vanes. This counter-balancing pressure can be varied by changing the angle at which the vanes are ground, so that they are held against the stator with only the necessary amount of pressure to produce an adequate seal. Compound pumping which increases the volume of delivery consists essentially of employing the ends of the vanes nearest the shaft to function as a piston-type pump.

The three pumps are available in range of volume capacities of 2½ to 12, 13 to 30, 37 to 60 gal. per min. Each size is furnished with foot mounting. The two smaller pumps are available with motor adaptor mounting. Approximate over-all diameter and length, including the shaft are respectively 3×6⅞, 4¾×8, 6¾×13 in.

WIM Identification Equipment Includes Finger-Print Outfit

The Model B WIM personnel-identification unit made by Photographic Equipment, Inc., 210 East Park Way,

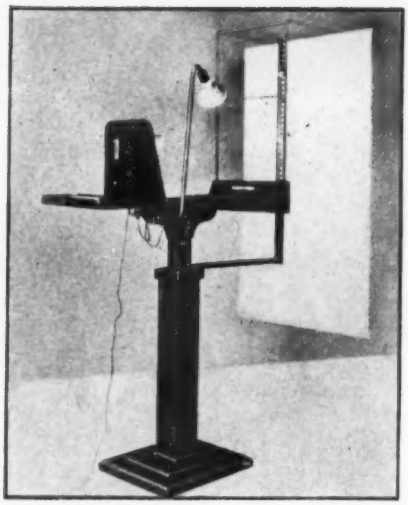
Machining tapered fins on aeroplane engine cylinder barrels with two banks of tools . . . on a No. 3A Duomatic Lathe. • • • •

Proudly worn since March 6, 1942

Write for complete illustrated Bulletin No. 601

THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO, U.S.A.

ENGINE TOOL ROOM AUTOMATIC LATHES

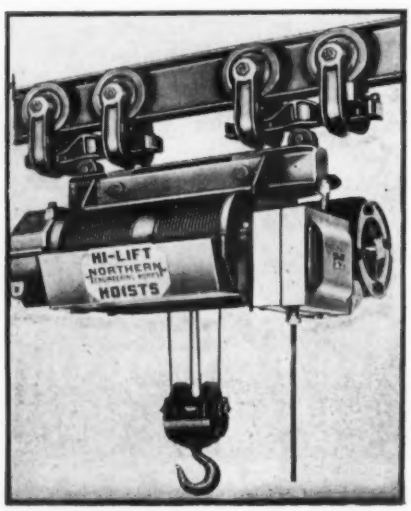


Pittsburgh, Pa., includes a white washable background, self-leveling easel base, finger-printing equipment, easily demountable light brackets for portability, and elevator-can't-slip ratchet lock as well as a choice of sizes and numbers. It is equipped with a height indicator which can be removed if desired and photographs the subject, height and number in one operation.

As many as 1,000 pictures can be taken in an eight-hour day. Each film roll has 24 exposures. A handy finger-print outfit can be attached to the platform behind the camera. The unit is portable, light in weight and has casters underneath the self-leveling pedestal base. The Model B unit takes pictures 1×1½ in. in size. The complete unit occupies a floor space of 30×54 in.

Northern Low-Headroom Hoist Fits Various Monorail Systems

For operation on the various types of special section monorail track systems, Northern Engineering Works, 2615 Atwater St., Detroit, Mich., has developed a line of low headroom hoists. These hoists, which are mounted on trolleys made to fit the monorail track system



used, provide maximum hook lift yet have the drum parallel to the tramrail track. The equipment is built in capacities from 1 ton up, and can be furnished with a variable speed push-button control. The line includes both cab and floor controlled types.

The hoist frame is rolled steel plate, gearing is machine cut and heat-treated to a hardness and depth that eliminates wear. The mechanical load brake can be reached and friction surfaces replaced without removing the hoist gear case cover, and the split gear case permits easy access to the gearing and bearings.

DuBois Plastic Safety Goggle Will Fit Over Eye Glasses

A plastic safety goggle made of Lumarith has been made available by DuBois Plastics, Detroit, Mich., and distributed exclusively by American Allsafe Co., Inc., Buffalo, N. Y. The mask is held in place by a band of narrow elastic that fits around the wearer's

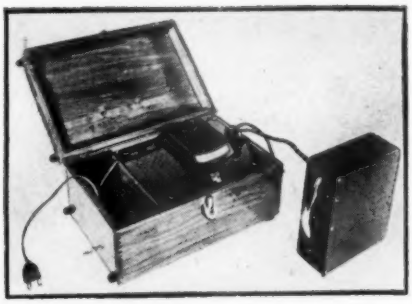
head. It offers complete visibility from all angles, and fits comfortably over all types of eye glasses.

The goggle can be placed face down without scratching the eyepieces. The eyepiece is replaceable and simply snaps into place. The mask is available in clear transparent Lumarith or in a pale green tint.

Photovolt Glossmeter Unit Gives Surface Finish Readings

Surface finish readings of a machined or polished surface can be obtained with the photo-electric Glossmeter developed by Photovolt Corp., 95 Madison Ave., New York, N. Y. It also has similar applications in testing of electroplated and coated surfaces. The unit operates by measuring reflectance of the surface.

The equipment comprises the instrument proper and the search unit which is connected to it by flexible cable. The search unit may be placed on the sample to be tested, or may be positioned



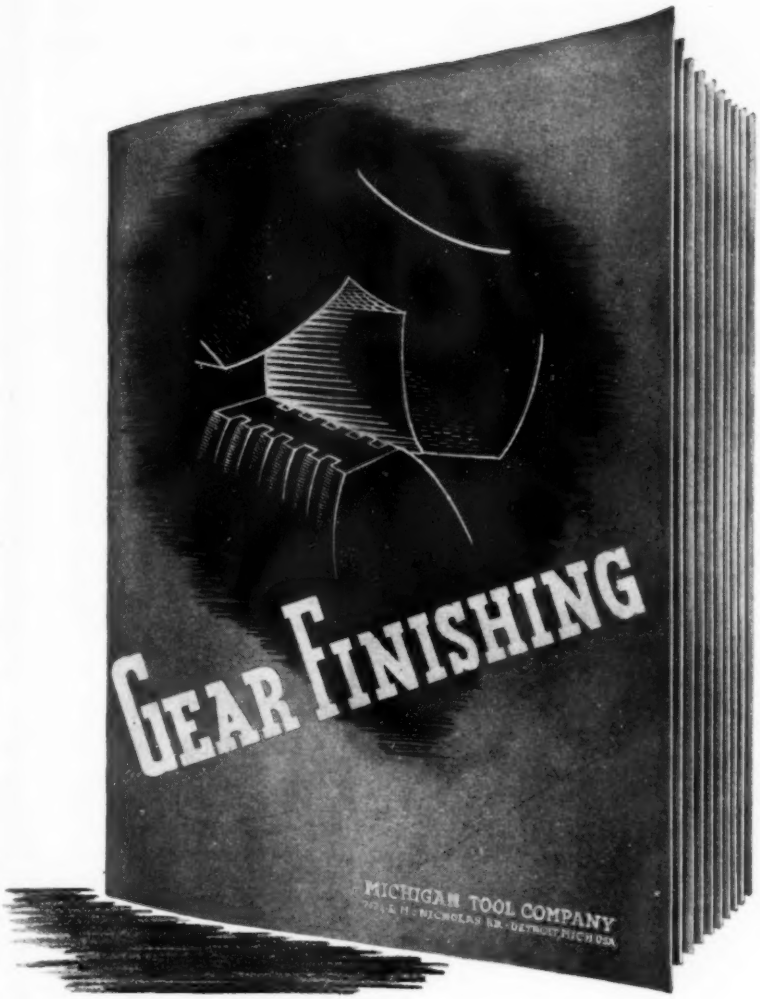
with the opening pointing upward, so that the sample is placed on top of it. For convenient measurement of vertical surfaces, the unit may be turned with the opening sideways. Sample can be of any size, and may be measured in rapid succession. This is a portable instrument and is available in two models.

Model 650 is operated by drycell batteries housed in the instrument casing, while the Model 660 is built for operation from 105-125 volt, 50-60 cycle a.c., and can also be furnished for operation from a storage battery. Both Glossmeter models can be provided with extra search units for diffused reflection. Measurements of specular and diffused reflectance can thus be carried out with the same instrument, using two different search units.

The light of an incandescent lamp is collimated by a lens and reflected by a mirror before striking the sample. An adjustment knob on the panel serves to set the instrument to give the desired reading for the standard in terms of which the measurements are to be taken.

A. O. Eye-Protection Glass Made for Welders' Goggles

Development of an eye-protection glass called Didymium-Noviweld for lenses in welding goggles is offered by American Optical Co., Southbridge, Mass. Such glass permits flame welders to see all the welding operation right through the yellowish cloud of flux-flare. The lenses protect the eyes by absorbing the invisible ultra-violet and infra-red rays generated during welding. Three shades of lenses are available, Nos. 4, 5 and 6, corresponding with shade numbers of the company's standard Noviweld lenses.



THE ANSWERS TO QUESTIONS LIKE THESE:

What is "Gear-Shaving"?

How does it work?
How accurate is it?
How does it compare with other methods?

Where Can It Be Used?

What kind of gears can be shaved?
Who is using "gear-shaving" today?
How many machine types and sizes are there?
How big a gear can be finished by "shaving"?
How small a gear can be finished by "shaving"?

What About Cost?

How many different gear sizes and types can be finished on one machine?
When should a rack or a rotary machine be used?
What tool life can be expected?
What does it cost to shave gears?

How Do You Use It?

How do you set up to shave different gear types?
What controls gear accuracy in "gear-shaving"?
What machine type should be used for any given class of gears?
How does it affect gear design?
How does the use of "gear-shaving" affect preliminary gear cutting operations?

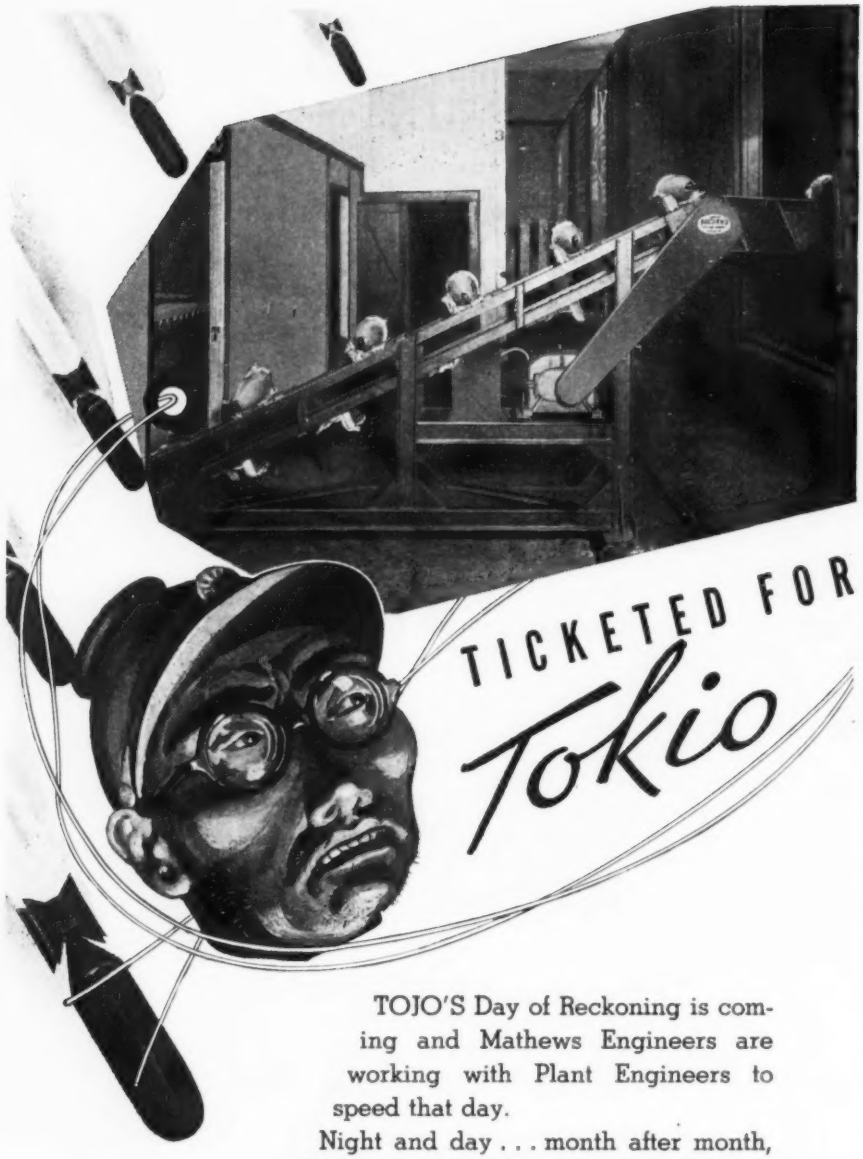
What About Curve Shaving?

When should "curve shaving" be used?
When should "curve shaving" not be used?

These and numerous other questions are answered in a new booklet just made available by Gear Production Headquarters. Write for a copy on your company letterhead. Ask for Manual No. GF-43.

MICHIGAN TOOL COMPANY
7171 E. McNICHOLS ROAD . . . DETROIT, U. S. A.

BUY U.S. BONDS STAMPS

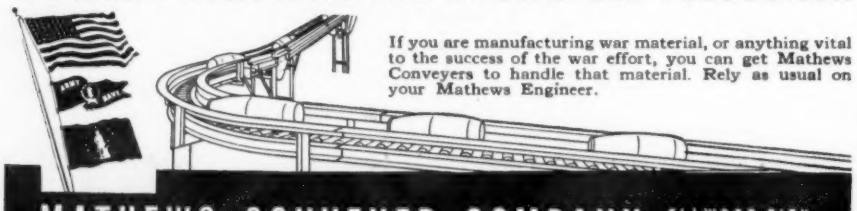


TOJO'S Day of Reckoning is coming and Mathews Engineers are working with Plant Engineers to speed that day.

Night and day . . . month after month, Mathews Conveyers are moving an endless procession of bombs, shells, cartridge cases, and vital plane parts, many of them destined to make it warm in Tokio.

If your production depends on precision movement of materials and supplies, a Mathews Time-Coordinated Conveyer System is a sure means of speeding operations all along the line. A Mathews Engineer will gladly consult with you on your problem.

MATHEWS CONVEYERS FOR MECHANIZED PRODUCTION



If you are manufacturing war material, or anything vital to the success of the war effort, you can get Mathews Conveyers to handle that material. Rely as usual on your Mathews Engineer.

MATHEWS CONVEYER COMPANY ELLWOOD CITY PENNSYLVANIA

NEW MATERIALS

Armor-Vit Metal Coating Forms Rust-Resistant Finish

Armor-Vit, which is a coating for metal products, has been developed by Chicago Vitreous Enamel Product Co., Cicero, Ill. After application of this coating by ordinary spraying equipment or dipping method, the curing treatment combines the ingredients of the coating into a hard, heat-resisting finish, which is insoluble in boiling water and resistant to most acids and alkalies.

The coating is applied in either one or two coats at 0.0005 to 0.0010 in. in thickness, and forms a rust- or corrosion-resistant finish for metal products. Finish is said to effectively withstand such acids as acetic, sulphuric, nitric and hydrochloric, and such chemicals as caustic soda, ethyl alcohol, toluene, sodium chloride solution, and others.

•

Curran Carbon Met. Solvent Substitutes for Carbon Tet.

Carbon Met. has been developed by the Curran Corp., Malden, Mass., as a substitute for carbon tetrachloride which is used for cleaning metal parts. This is a water-white methalated hydrocarbon solvent which evaporates, and is characterized by quick cleaning as well as dissolving action on burnishing compounds, oxidized oils, gums, and the like. It is said that this solvent does not induce any corrosive or rusting tendency of ferrous metals.

TRADE PUBLICATIONS

AIR CLEANING Illustrated Bulletin B-8605 tells what Precipitron electric air cleaning is, how it operates and how it is installed. "Air Clean As a Whistle" is the title of the 4-page bulletin issued by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

AIRCRAFT TOOLS Catalog No. 4 of the Products Engineering Co., Los Angeles, Calif., contains blueprint drawings, illustrations and descriptions of toggle clamps, extended base toggle clamps, quick action toggle clamps, drill guide pressure foot, drill jig bushings, inspection and locating pins, scribe line duplicators, dimpling sets, squeezer sets, flush rivet sets, standard rivet sets, Dzus fastener driver, drop forged "C" clamps, speeddrivers and duplicating punches.

BELLOWS A 32-page book covering the "Spring-Life" metal bellows is offered by the Cook Electric Co., 2700 Southport Ave., Chicago, Ill. Printed in two colors, complete with blueprints, examples of bellows now in use, and

specification form, this book tells all simply, concisely and in the engineer's own language.

BLOWERS Allen Billmyre Corp., 431 Fayette Ave., Mamaroneck, N. Y., offers Bulletin I-100 which concisely describes many types of turbo and rotary blowers, and also stationary and portable vacuum cleaners for industrial plants.

CHAINS Chains, sprockets and couplings for positive power transmission are illustrated and described in the 63 pages of the catalog issued by Ramsey Chain Co., Inc., Albany, N. Y.

COATED ABRASIVES "Blueprint for Faster, Better Production With Coated Abrasives" is the title of a 16-page technical book in three colors published by Behr-Manning, Troy, N. Y., in connection with coated abrasive products.

DRILLING Specifications and tooling set-ups for the 445 independent, two-spindle deep hole drilling and boring machine are included in the illustrated folder prepared by the W. F. and John Barnes Co., Rockford, Ill.

FILES "File Filosophy" is the title of the 48-page booklet prepared by Nicholson File Co., Providence, R. I., to help tool users select the right file and use it correctly.

FURNACES A 12-page booklet containing drawings, photographs, and descriptions of magnesium melting, holding and alloying furnaces is offered by Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago, Ill.

GAGE BLOCKS "How to Make Your Standards Last Longer" is the title of a 6-page booklet on the care of gage blocks offered by the Dearborn Gage Co., Dearborn, Mich.

GEARS "Carburizing Gears in the Electric Salt Bath Furnace" is the title of a reprinted article by William F. Sorenson, Metallurgist, Yale & Towne Mfg. Co., available from Ajax Electric Co., Inc., Frankford Ave. at Delaware Ave., Philadelphia, Pa.

GRINDERS The McGonegal Mfg. Co., Rutherford, N. J., has prepared operating manuals to assist in simplifying cleaning, lubricating and operating of Models J-2-A, J-3, J-30, J-40 and J-4 Themac grinders. Advise type and serial numbers of grinders when requesting manual.

HYDRAULIC EQUIPMENT Catalog No. V-43, a wartime buyer's reference on hydraulic hand jacks, 3 to 50 tons capacity; wheeled service jacks, gage-equipped jacks; "Porto-Power" hydraulic units, maintenance kits, motor vehicle assortments and pipe benders, is offered by Blackhawk Mfg. Co., Milwaukee, Wis.

LATHES The Logan Engineering Co., Chicago, Ill., has issued a catalog illustrating, describing and giving prices and specifications on their back geared

How to AVOID Saw TROUBLES

To help you make hack saw blades and band saw blades cut more efficiently and last longer

Free, New Handbook for Shop Men

Give this new Capewell Handbook to the man at the saw. He will find helpful tips for getting longer use from power hack saw blades, hand blades and band saw blades. This information includes hints about avoiding broken blades, excessive wear, crooked cuts. Two pages of pictures make instructions simple. Charts show tooth requirements and cutting speed for various metals, and blade sizes for various machines. Simply write us for Booklet No. M339D. No obligation. State number of workmen to receive them. Send today.

The Capewell Mfg. Co. · Hartford, Conn., U. S. A.

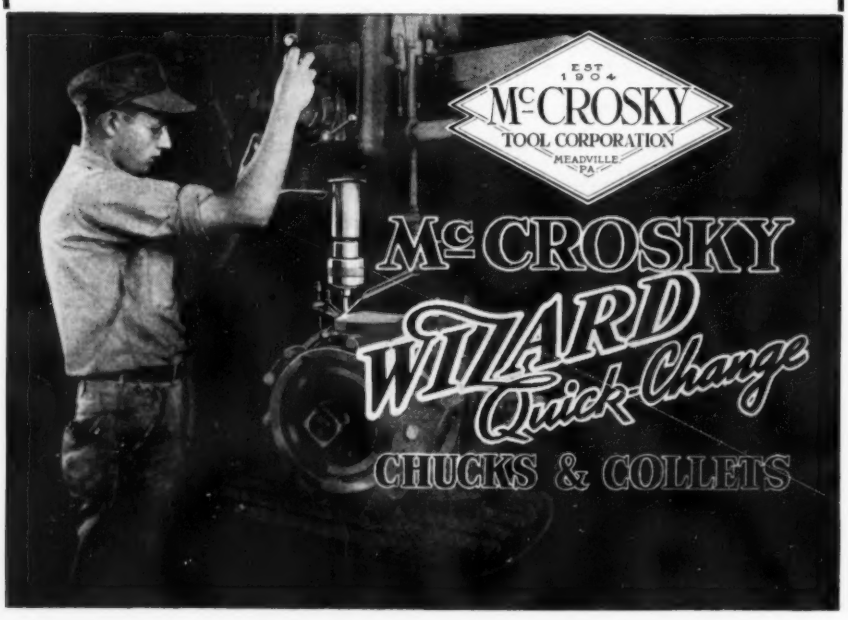
CAPEWELL

THE TREND IS TO TECHNITE

THE MOLYBDENUM HIGH SPEED HACK SAW BLADE

Eliminate Time-out for Tool Changes

McCROSKY's WIZARD Quick-Change Chuck and Collet outfit makes tool changes on multi-operation drill press jobs into a continuous operation. The operator can change tools with one hand *without stopping the spindle.* Tools are held rigid and centered, permitting a WIZARD outfit to be used *horizontally* as well as vertically. Four sizes of WIZARD Chucks and Collets, and different types of collets for every kind of tool. Full details in McCROSKY Bulletin 16-D, and operating instructions in the McCROSKY WIZARD Quick-Change Chuck Manual.



screw cutting lathes, manufacturing turret lathe, hand screw machine and lathe accessories.

OILSEALS The latest detailed information, recommendations, applications, diagrams, listings and prices are presented in the bulletin entitled "New Data on Oilseals and Greaseals" published by the Gits Brothers Mfg. Co., 1846 South Kilbourn Ave., Chicago, Ill.

PAINTS The 10-page catalog of S. C. Johnson & Son, Inc., Racine, Wis., on wax-fortified paints tells why they are wax-fortified, what makes them economical and where they are used.

PUMPS AND VALVES The catalog of the Fulflo Specialties Co., Inc., Blanchester, Ohio, is divided into five sections headed: "General Data," "Valves —Standard, Flange, Special," "Pumps—Motor Driven," "Pumps—Direct Drive, Belt Drive," "Pumps—Special."

SWEEPERS Two new editions of a 4- and 6-page catalog describing the Commander, Fleetway and Detroit models have been released by the Moto-Mower Co., Industrial Motor Sweeper Division, Detroit, Mich.

VALVES Printed in two colors, 36-page Bulletin A-4, issued by the Distributor Products Division, Watson-Stillman Co., Roselle, N. J., describes and pictures each unit in the manufacturer's line of bronze, forged steel and cast steel valves, including several new types. The bulletin is divided into six sections for easy reference.

NEW BOOKS

THE MACHINE TOOL PRIMER—*Written and published by the Herbert D. Hall Foundation, 1060 Broad Street, Newark, N. J. 280 pages.* $1.50.

In this introduction to the machine tool industry, the authors have attempted to show the place of metal working in the general picture of American culture. The book begins by defining the metal-working industry in terms of its products and then takes up the five basic machine tool operations and the machines in which these operations are performed.

The book is divided into two parts: the first, called "What Machine Tools are Used For," introduces the subject, discusses mass production, the skills required, inspection practice, tooling-up, and time and motion study. The second part, "What Machine Tools Are," devotes a chapter each to drilling, engine lathes, turret and automatic lathes, planing and shaping, milling, grinding and press-working operations.

The material included is intended as an aid to learners in technical schools and in specialized machine shop training courses. It is written in language that a school boy or a person completely ignorant of shop work can understand, yet it covers its subject

thoroughly enough to give any adult an intelligent understanding of what machine tools are. It is, moreover, a classroom text rather than a shop manual. No operation data is given nor are problems and projects for the students' use included.

The book is clearly and fully illustrated, containing 341 numbered illustrations. In many instances, machines and processes are broken down to show the details or order of operations. The binding and typography are attractive, and the indexing complete.

•

AUTOMATICS IN ENGINEERING PRODUCTION —*Compiled by a staff of technical experts under the direction of E. Molloy. 112 pages. Published by Chemical Publishing Company, Inc. Brooklyn, N. Y.* $2.50.

The general subject of automatic machinery is discussed in this volume by specific consideration of six makes of machines:

Jones-Shipman automatic drilling machines

Brown & Sharpe automatic screw machines

B.S.A. single-spindle automatic screw machines

Acme-Gridley automatic bar machines

Herbert junior automatic lathe

Four-spindle Conomatic

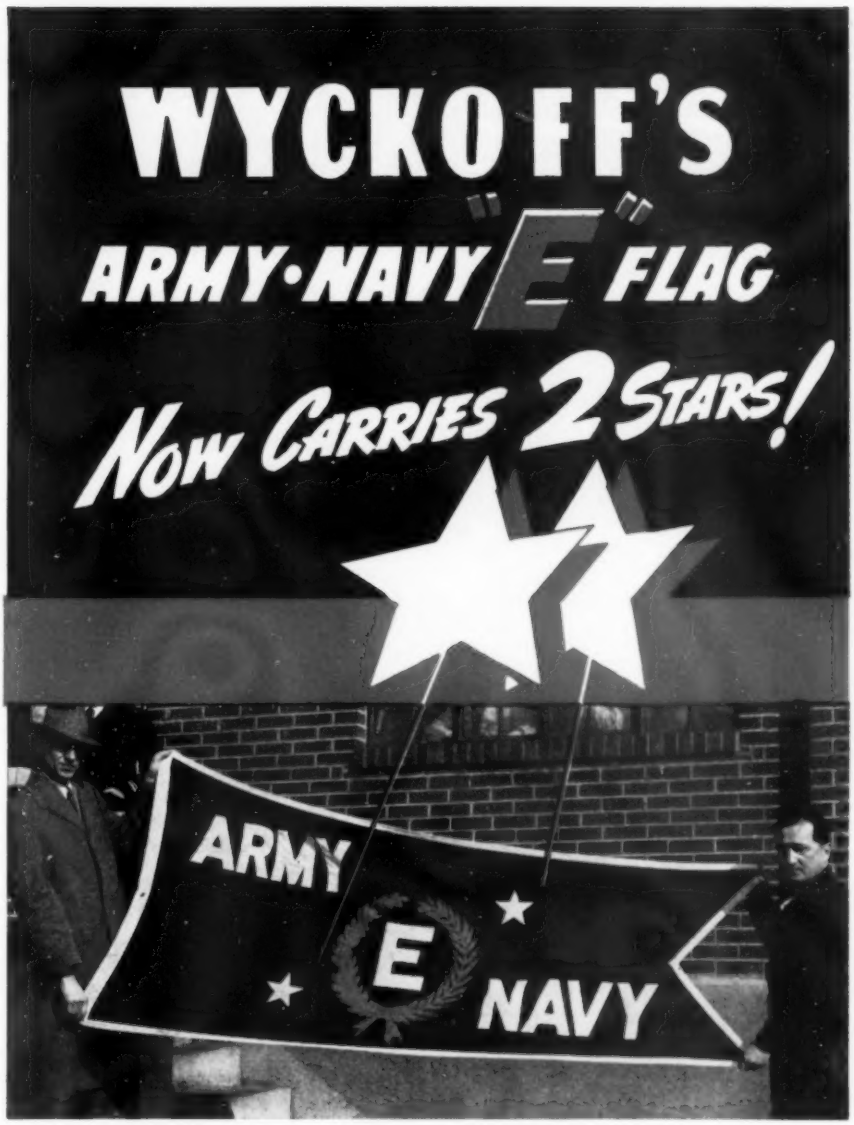
The leading features of the construction of each machine are described, and in most cases practical information has been included, showing the methods which should be employed in setting up and operating the machines. Special treatment is given to setting-up the Brown & Sharpe automatic screw machine, including a special section on correct cam design. Much of the information is from the manufacturer's literature.

•

A.S.T.M. STANDARDS ON COPPER AND COPPER ALLOYS—*Sponsored by A.S.T.M. Committee B-5 on Copper and Copper Alloys, Cast and Wrought. 385 pages. Published by The American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa.* $2.25.

This 385-page book gives in their latest approved form, as of February, 1943, all A.S.T.M. standards on copper and copper alloys covering cast and wrought material, alloys used for electrical conductors, and non-ferrous metals used in copper alloys. Important features in the new publication are the emergency alternate provisions and emergency specifications to aid in expediting procurement.

Fifteen of the standards cover copper and copper-alloy wire and cable including the new emergency specification for lead-coated and lead-alloy coated copper wire. There are 13 specifications covering non-ferrous metals used in copper alloys such as lake copper, fire-refined copper (other than lake), phos-

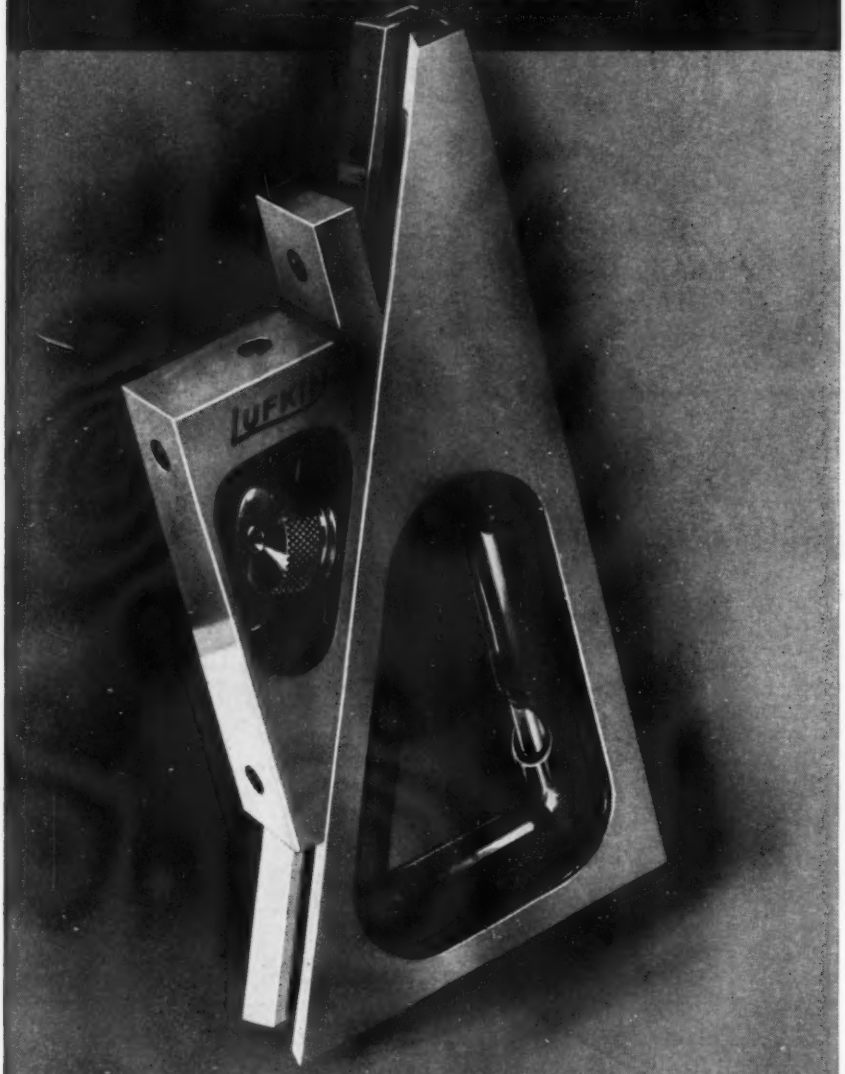


The Army-Navy "E" Flag that so proudly flies over our plants now carries *two* stars which demonstrates *continuous* outstanding achievement in the production of war materials by Wyckoff Production Soldiers. Since Pearl Harbor Wyckoff has been honored with four government merit awards — the Navy "E" in January 1942; the All Navy Burgee "E" in April 1942; the Army-Navy "E" with added star in August 1942, and in February 1943, a renewal of the Army-Navy "E" with two stars.

WYCKOFF DRAWN STEEL COMPANY

First National Bank Bldg., Pittsburgh, Pa.
3200 South Kedzie Avenue, Chicago, Ill.
Mills at Ambridge, Pa., and Chicago, Ill.

LUFKIN MASTER
PLANER GAGE



HANDLES A WIDE VARIETY OF JOBS

The precision-built Lufkin Master Planer Gage is designed to not only serve better as a planer gage, but it is adaptable to a great variety of other jobs for which the ordinary gage is unsuited. It can be used with gage blocks in building up work on surface plates. It can be used with a Sine Bar in grinding angles. It can be used with an indicator to transfer measurements. It can be used as an adjustable parallel, and it can be used to set cutting tools. The Lufkin Master Planer Gage is truly a "Master" tool. Settings range from ¼" to 6½" and with the extension the range increases to 9". Write for complete Lufkin Catalog.

BUY THROUGH YOUR DISTRIBUTOR

LUFKIN

SAGINAW, MICHIGAN · NEW YORK CITY

phor tin, nickel, pig lead and the emergency specification covering fire-refined copper, termed "Braden." In the field of copper-plate, sheet and strip, there are 16 specifications which include cartridge brass sheets, case cups, gilding metal, etc.; 15 standards pertain to rods, bars and shapes; and nine to copper pipe and tubes.

A valuable part of the compilation includes the several widely used specifications on copper-base alloys for sand castings. The book is completed by standard methods of test including expansion test (pin test), mercurous nitrate test, hardness conversion table and other test procedures.

•

MECHANICS OF MATERIALS—*By S. G. George and E. W. Rettger, professors of mechanics of engineering, Cornell University; revised by E. V. Howell, assistant professor. Second Edition.* 491 *pages. Published by the McGraw-Hill Book Company, Inc.,* 330 *West* 42 *St., New York, N. Y.* $3.75.

Despite its use in teaching college courses in mechanics since 1935, Professor Howell did not find it necessary to alter this book in important ways. Chapters on beam theory have been put in a more desirable sequence; the data in problems have been changed. Many of the problems have therefore been rewritten, and some 256 review problems added. A new feature is an article on the graphical solution of combined stresses. Viewed on the whole, the second edition contains more material than is required for an elementary course. A simple style for written matter and illustrations is retained so that the student can grasp essential parts of the subject in the time available.

Putting Ideas to Work

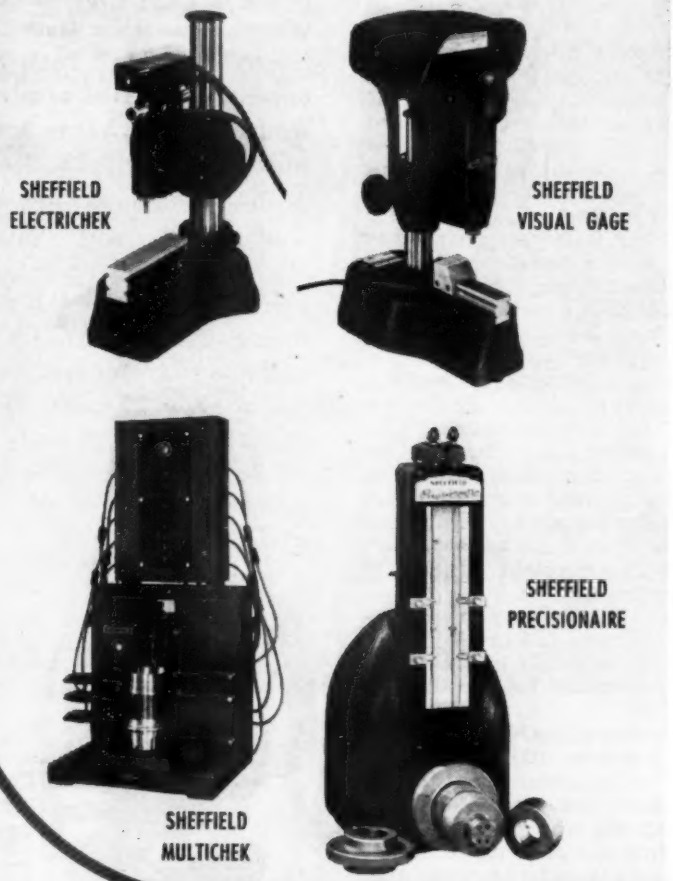
By NELSON HALL

Good ideas should not perish. There is a place for them. Nevertheless, when a good tool designer sees his ideas sidetracked he does not feel like offering any more. In fact, he smothers his ideas and accepts the system in vogue.

The present system in many contract tool design organizations is much as follows: the contact man, who is usually more of a salesman than a mechanic, calls on a purchasing agent who often is more of a proverbial "scotchman" than a mechanic. The purchasing agent has a requisition from a master mechanic who has been promoted in an expansion program and is often more of a politician than a mechanic.

The result is that the contact man brings back to the designer a scheme having a limited amount of mechanical worth. The designer then uses this data to draw up a sketch. The contact man, the purchasing agent, and the master mechanic then go over the

don't let faulty inspection cause you to scrap good parts . . . . .



It has been repeatedly found that close tolerance parts rejected by fixed size gage inspection were quite often within limits when checked on a Visual Gage. In other cases, parts accepted by the fixed size gage are rejected by this more precise gaging instrument. The difference is the human factor—skill—experience—temperament—health.

Sheffield Gaging Instruments remove the human factor and in addition provide greater precision and faster inspection all at lower inspection costs. Write for Bulletin No. 43-1 describing the Visual Gage, the Precisionaire, the Electrichek, and the Multichek.

THE **SHEFFIELD** CORPORATION

DAYTON, OHIO, U. S. A.

SHEFFIELD GAGES

start

right

URGENCY of production requires precision fit in less time! By peeling Laminum shim adjustments you speed accurate assembly . . . and make possible the same easy adjustments in field service.

Laminum shims (.003 or .002 in. laminations bonded into a solid unit easy to peel) are cut to your specifications.

Stock shim materials obtainable from mill supply dealers. (Write us for sample and illustrated shim application file-folder.)

Laminated Shim Company
Incorporated
50 Union Street Glenbrook, Conn.

it's
LAMINUM
THE SOLID SHIM THAT peels FOR ADJUSTMENT

sketch and make their recommendations.

From these recommendations the layout man is requested to make a drawing that will show how the tool will work, look simple, and sell easily. In laying out a job to scale, many things that were hidden before are uncovered and new ideas will suggest themselves. But before these ideas are accepted they must pass the leader on the floor, the contact man, the purchasing agent, and the master mechanic—and that is a long drill. After this the detailers and checkers take a round at it, until at last you are told that too many hours were put on the job—"after this, just follow the purchaser's ideas and let it go at that."

After a few of these experiences, one just settles down to draw, and draw.

Bearing Alloys Save Tin

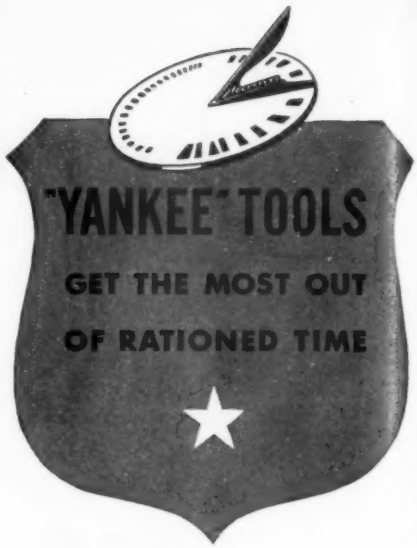
Use of several alloys as substitutes for the standard 80:10:10 bearing bronze is suggested in a technical publication by the Battelle Memorial Institute. The bronze industry, the paper points out, is the third major user of refined tin.

Bearing bronze most used for bushings in which the shaft runs directly on the bronze is constituted of 80 percent copper, 10 percent lead and 10 percent tin. This alloy has special virtues that make it especially suitable for bearing use. Various emergency alternatives have been proposed in which the tin content is dropped to as low as 6 percent, but the Battelle experiments show that satisfactory bearing alloys can be made with a tin content as low as 2.8 percent, or, for some purposes with no tin at all.

In performance tests of bearings manufactured from two of the developed alloys, it was established that the alloys were much better for some purposes than the standard 80:10:10 alloy. Both of these contained no tin at all, it being entirely replaced in one by copper and in the other by copper, silver and phosphorus in the ratio of 4:5:1. Another alloy in which tin was reduced to 2.8 percent by the substitution of antimony and copper for tin, gave a behavior almost identical with that of the standard alloy in the performance test.

The substitute alloys have tensile and hardness properties different from the standard, but performance tests do not indicate difficulties because of these differences. The practicability of manufacture from standard tin-containing scrap has been taken into consideration, and, technically, it would appear that from among the alloys one can be chosen to fit all needs for 80:10:10 bronze.

The possibility of conserving several thousand tons of tin a year by use of substitute bearing alloys is of especial concern at the present, because of a recent government order further restricting tin consumption for 1943 by 12,000 tons.



A half-century before death rained from the skies over Pearl Harbor, "Yankee" Tools were putting *extra* minutes, *saved* seconds, into the hands of skilled mechanics everywhere. Now, when time is of the essence, "Yankee" Tools continue to speed production, to salvage that remnant of time left to America in which to deliver the knock-out blow.

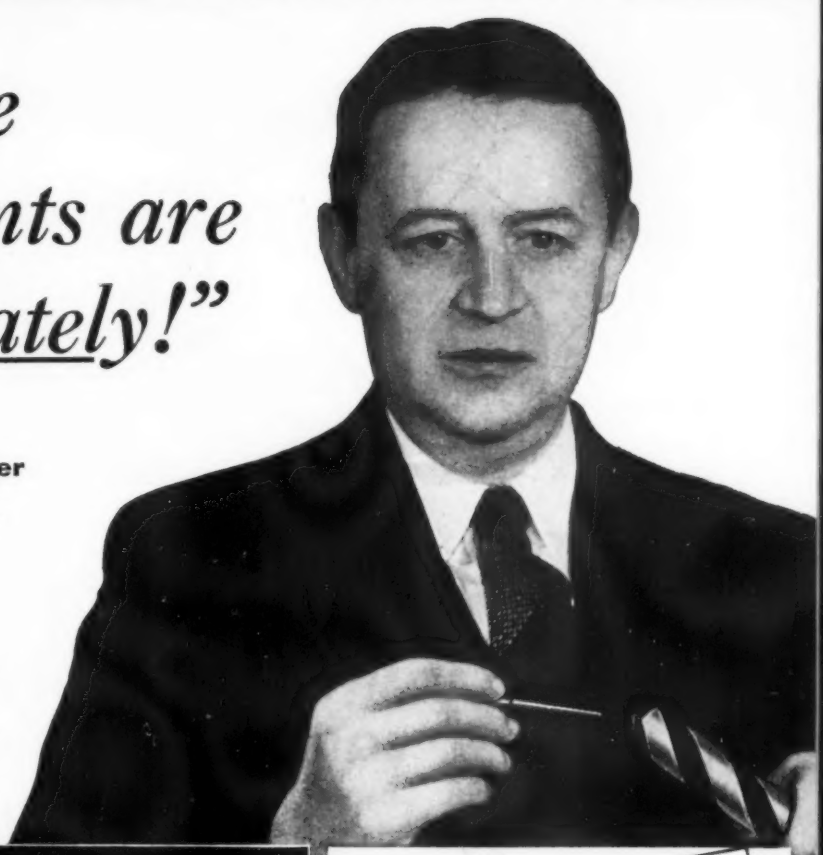
The war we didn't want will be behind us one day, and "Yankee" Fine Mechanics' Tools will have had a part in putting it there. In the meantime, give America, and all America means to you, your best. And, when you re-order "Yankee" Tools, be sure to provide priority ratings whenever possible. Order through your supply house or write to us . . . c/o Dept. AM4.

"YANKEE" VISES
Four Handy Sizes with Swivel Base.
V-block holds round stock securely.

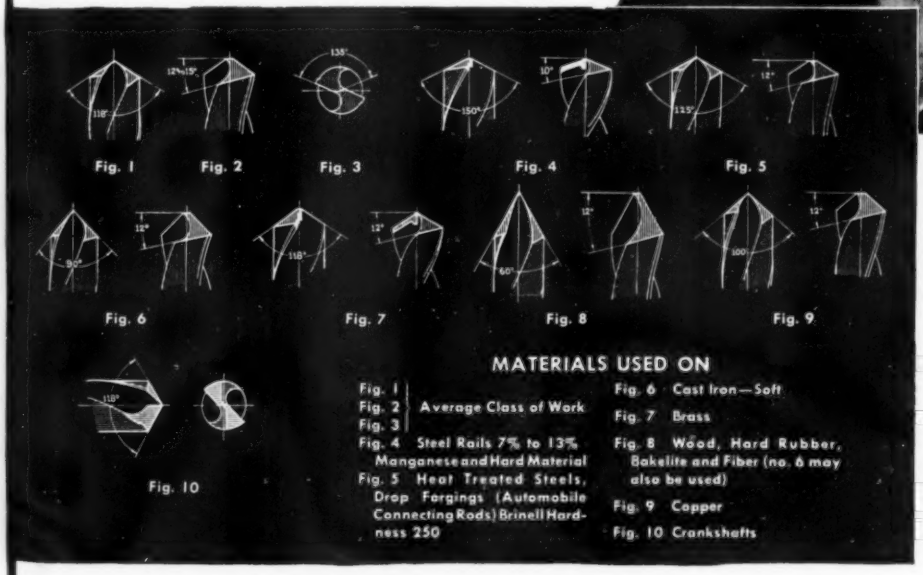
"YANKEE" TOOLS
make good mechanics better
North Bros. Mfg. Co., Phila., U. S. A.
Established 1880

"Be sure twist drill points are ground accurately!"

says **A. J. SNYDER, Works Manager**
MORSE TWIST DRILL & MACHINE CO.
New Bedford, Mass.

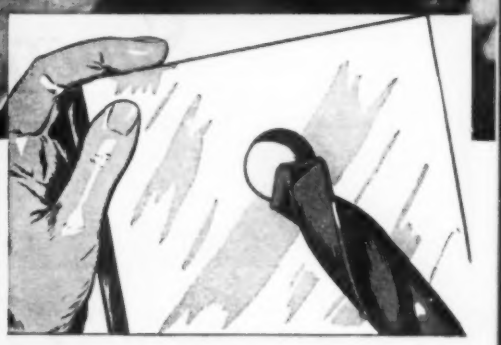


OBTAINING MAXIMUM EFFICIENCY from twist drills is possible only when points are ground correctly. In modern drilling practice, drilling different grades of materials often requires a modification of the commercial 118° drill point. For example, hard materials require a blunter point than do soft materials. (See chart below.)

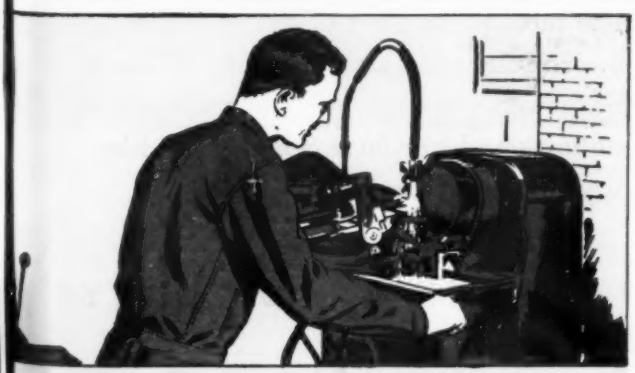


MATERIALS USED ON

Fig. 1, Fig. 2, Fig. 3 — Average Class of Work
Fig. 4 — Steel Rails 7% to 13% Manganese and Hard Material
Fig. 5 — Heat Treated Steels, Drop Forgings (Automobile Connecting Rods) Brinell Hardness 250
Fig. 6 — Cast Iron—Soft
Fig. 7 — Brass
Fig. 8 — Wood, Hard Rubber, Bakelite and Fiber (no. 6 may also be used)
Fig. 9 — Copper
Fig. 10 — Crankshafts



"FOR A DRILL to perform satisfactorily, the cutting edges should have a proper and uniform angle with the longitudinal axis of the drill. Also, the cutting edges should be of exactly equal length, with the proper lip clearance or contour of the surface back of the cutting edges. This clearance must be the same on each lip. When cutting lips are not uniform, holes will be oversize and the drill will wear on the margin of one cutting lip."

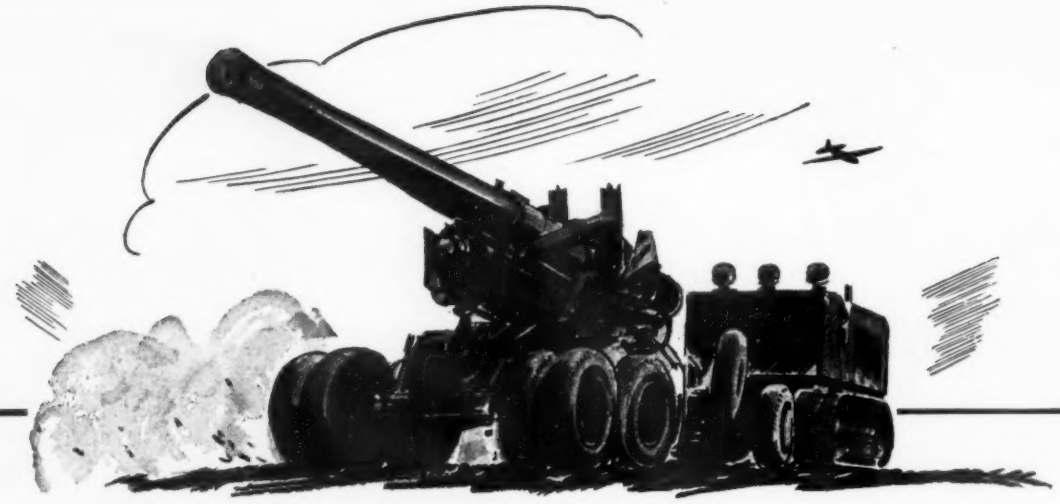


"THE FORM of a drill point exerts a powerful influence upon the rate of production, accuracy of drilled holes and the number of holes which can be drilled between successive grindings. Drill grinding machines, located in tool rooms throughout the plant, are steps toward getting the correct point on drills, as it is difficult to grind a point by hand that will give the desired results without too much loss of time."

The correct cutting oil is as important to proper drilling operations as the correct grinding of the drill points. That's why Shell has developed a control technique that "balances" the oil to the machine, the application and the tool. Call in the Shell man now for details.

SHELL

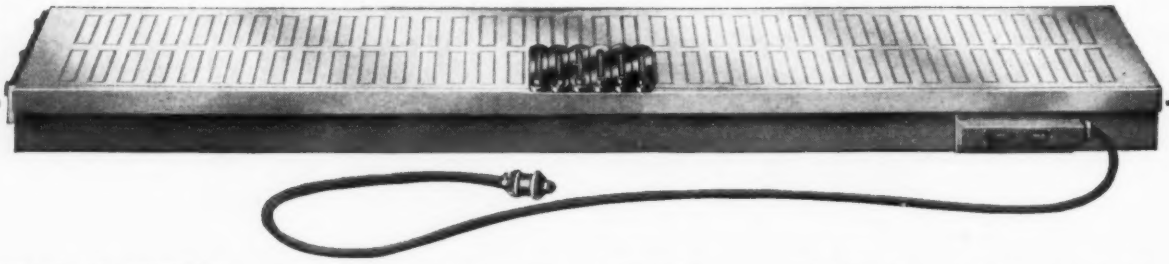
SHELL LATA OILS
FOR METAL WORKING



The Caissons Roll Faster

FROM WAR-PRODUCTION MACHINES EQUIPPED WITH THE FASTEST SET-UP DEVICE

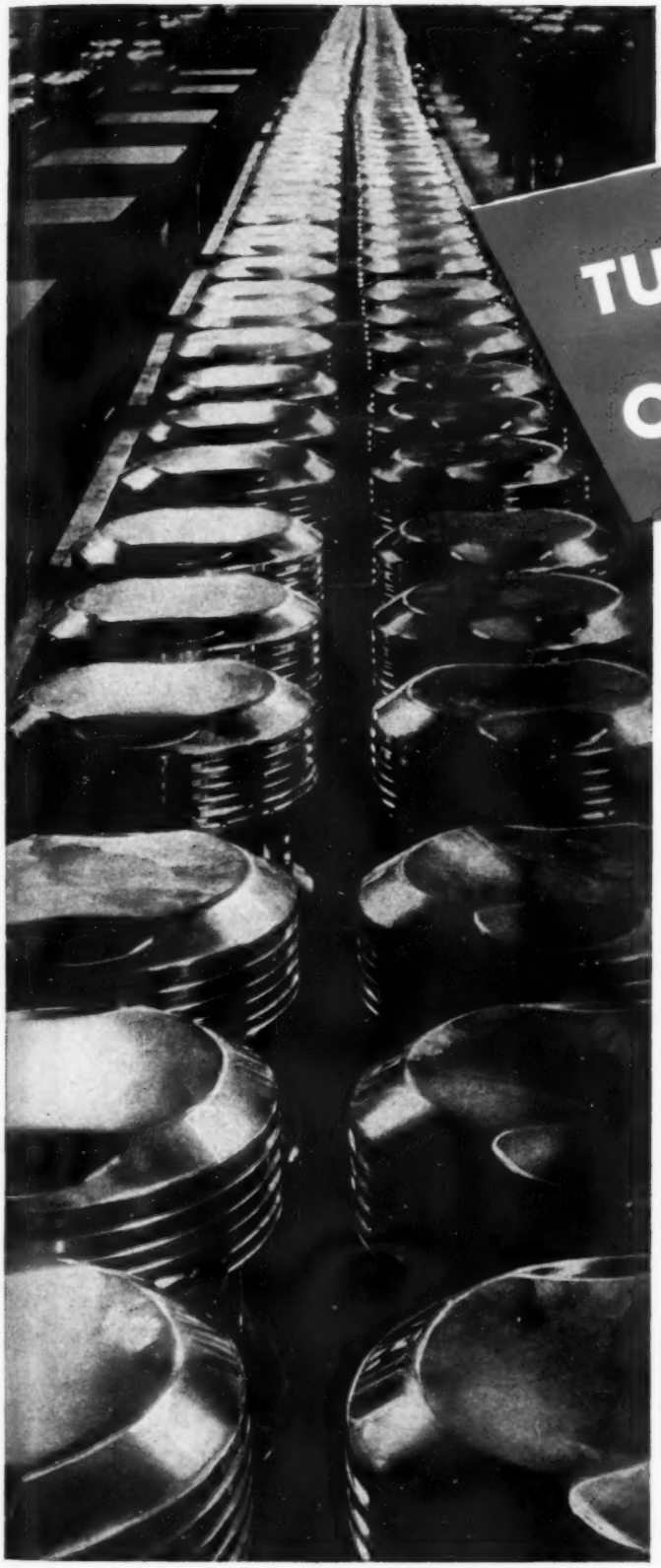
Superpower Magnetic Chucks



WAR MATERIEL moves to completion at the double quick, when set-up time is saved by Superpower Magnetic Chucks. With a Superpower on his machine, an operator simply positions a large casting or hundreds of small pieces on the chuck faceplate . . . flicks the switch . . . and that's all there is to it. Magnetism holds the work immovably under heaviest feeds of grinding wheels or cutting tools. Thus hours of delay are salvaged for working . . . which sharply increases the production not only of grinders, but of millers, planers, lathes, shapers. Work-range is also widened by the greater versatility of set-up made possible by Superpower. The complete mechanical story of the world's most powerful and reliable magnetic chuck is told in a new twelve-page, profusely illustrated publication which you may have by writing, on your firm's letter head, to:

THE TAFT-PEIRCE MANUFACTURING COMPANY

WOONSOCKET *RHODE ISLAND*



TURNING THEM OUT *Faster*

IN MEETING the Government's goal of 10,000 planes a month, improved machining practice has been continuous.

A recent example is the machining of aluminum and magnesium alloys in engine plants, where an entirely new cutting coolant is permitting faster cutting speeds ... *Texaco ALMAG Cutting Oil.*

Equally suitable for both *al*uminum and *mag*nesium, *Texaco ALMAG Cutting Oil* adequately cools and lubricates the cutting tools, prolongs their life, increases cutting speeds, steps up output. *ALMAG* is transparent, permitting the operator to *see* ... and is non-irritating to the skin.

So effective have Texaco Lubricants proved that they are definitely preferred in many other important fields, a few of which are listed below.

A Texaco Lubrication Engineer specializing in cutting coolants will gladly cooperate in the selection of the most suitable lubricants for your equipment. Just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write:

The Texas Company, 135 E. 42nd St., New York, N.Y.

THEY PREFER TEXACO

★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated and fueled with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

TEXACO

REG. T.M.

TEXACO Cutting and Soluble Oils

FOR FASTER MACHINING

SAFCO *Metal Working Lubricants*

New highs in metal working production records have kept pace with outstanding Engineering and Manufacturing skills as expressed in Curtiss-Wright's "Commando" and "Warhawk" and Bell Aircraft's "P 39-Airacobra".

Swan-Finch lubricants are used in the plants of these two leading plane manufacturers. Thus SAFCO lubricants play an invisible but important part on every front — in every battle.

There are many metal working operations but only one lubricant which is "on the beam" for each particular job. There's a vast difference between ordinary quality and SAFCO highly specialized lubricants.

Next time *specify* SAFCO and take advantage of the many ways it can be put to work to increase production — conserve manpower hours and lower operating costs.

1 *Shown here in relative size, the Curtiss "Commando" (C-46) the world's largest twin-engined transport and the Curtiss "Warhawk" (P-40F), one of the most universally used fighters today.*

2 *The Army P-39 Airacobra, cannon-carrying fighter, is now serving with distinction on all major fighting fronts. In addition to its 37 mm. cannon, it mounts a full complement of machine guns. Famed for its maneuverability, it is rated in the 400-mile-an-hour class of combat aircraft.*

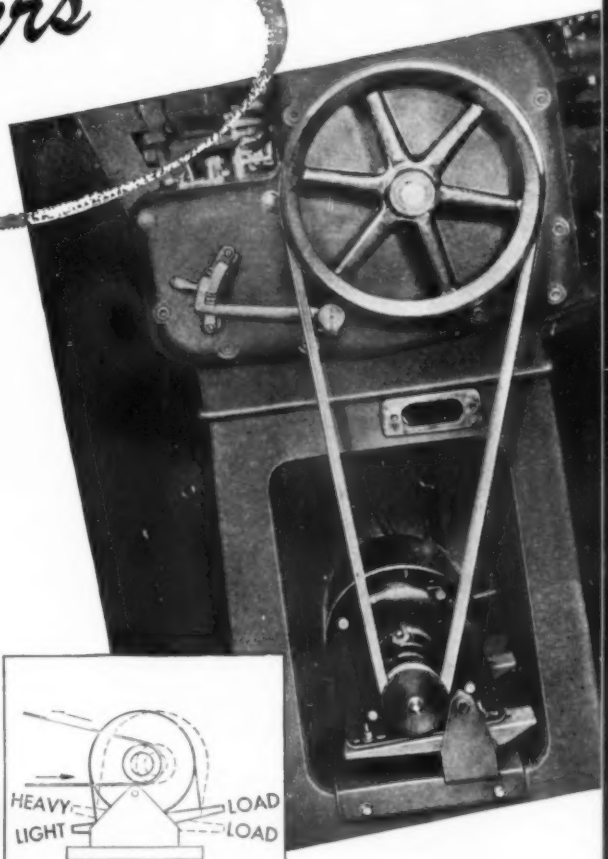
On the BEAM

SWAN-FINCH

SWAN-FINCH OIL CORPORATION

Offices		Plants	
New York City—Executive Offices	R.C.A. Building, West	Newark, N. J.	120 Lister Avenue
Chicago, Ill.	201 North Wells Street	Chicago, Ill.	5849 West 66th Street (Clearing, Ill.)
Detroit, Mich.	2596 Hart Avenue	Detroit Mich.	2596 Hart Avenue

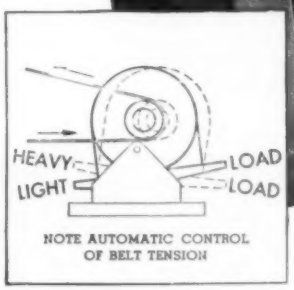
How one manufacturer eliminated "Belt-Eaters" and stepped up production 15%



In operating 50 candy cutting and wrapping machines, a well-known candy manufacturer faced several production and maintenance problems. Each of his machines had to be stopped ten times a day to be reloaded with wrapping paper. Since the starting load was 75% over normal load, belts and bearings wore out rapidly due to the high tension made necessary by the overload. Now he reports that by equipping all fifty machines with American Econ-o-matic Wedgbelt Drives, the trouble is eliminated. Belts take high starting load readily without slip. Belt take-ups have been entirely eliminated. Belt and bearing life increased. Production stepped up 15%. And maintenance costs are substantially cut.

Whether starting loads are light or heavy, improper belt tension results in many costly production and maintenance problems. When belts are too loose, you are losing R.P.M. and cutting down on the productive output of your machines. When tension is too tight, belts and bearings burn up, forcing shutdowns and interrupting production.

By changing over to an American Econ-o-matic Drive, you overcome these problems. You boost your machine output. You greatly increase belt and bearing life. The Econ-o-matic Drive is an American Short-Center Drive —either Flat-belt or V-belt—with an Econ-o-matic Motor Base that gives you *automatic* belt tension control. No more worry about belts too tight or too loose—no lost R.P.M.—no slippage—no unnecessary "time-outs" to make frequent manual adjustments—after you install American Econ-o-matic Drives.



NOTE AUTOMATIC CONTROL OF BELT TENSION

AMERICAN Econ-o-matic DRIVE

The load governs the belt tension. Here is the heart of the Econ-o-matic Drive . . . the American Econ-o-matic Motor Base. It *automatically* and *instantly* matches belt tension to each variation in the load on the motor. When the load is heavy, motor base pulls and tightens the belt. When the load is light, motor base slackens and loosens the belt. No slide rails or idlers to adjust. It's *automatic!*

Check these advantages of the AMERICAN Econ-o-matic DRIVE (Short-center Flat- or V-Belt Type)

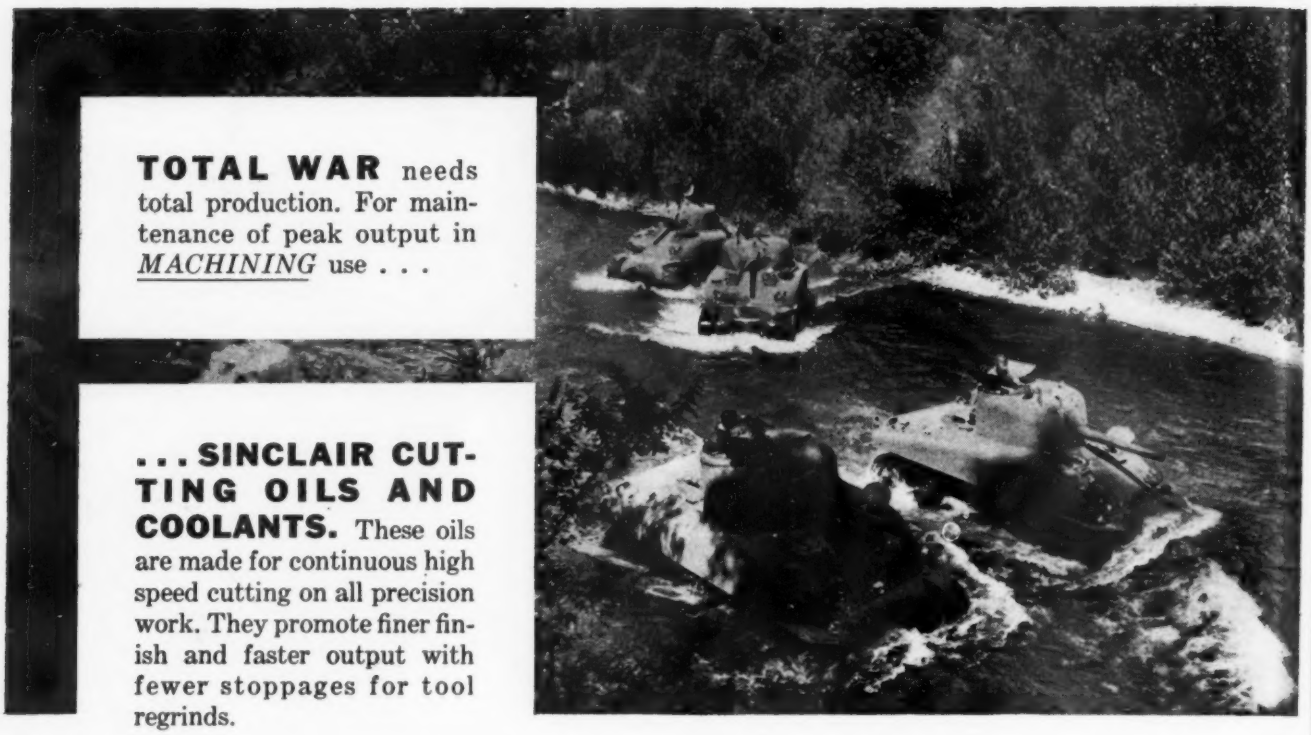
- ★ *Longer life for belts and bearings*
- ★ *No belt slip—no lost R.P.M.*
- ★ *Maintenance man-hours greatly reduced*
- ★ *Smooth, cushioned starting*
- ★ *Increased machine output*
- ★ *Substantial power savings*

Navy "E" for excellence awarded February 12, 1942

Get This New Econ-o-matic Catalog

36 pages of helpful information that shows you how to solve drive maintenance problems—how this drive can help you increase machine output. This catalog provides you with complete information on American Econ-o-matic Drives, and shows how to select the right drive for your purpose. Send for your copy. Write now.

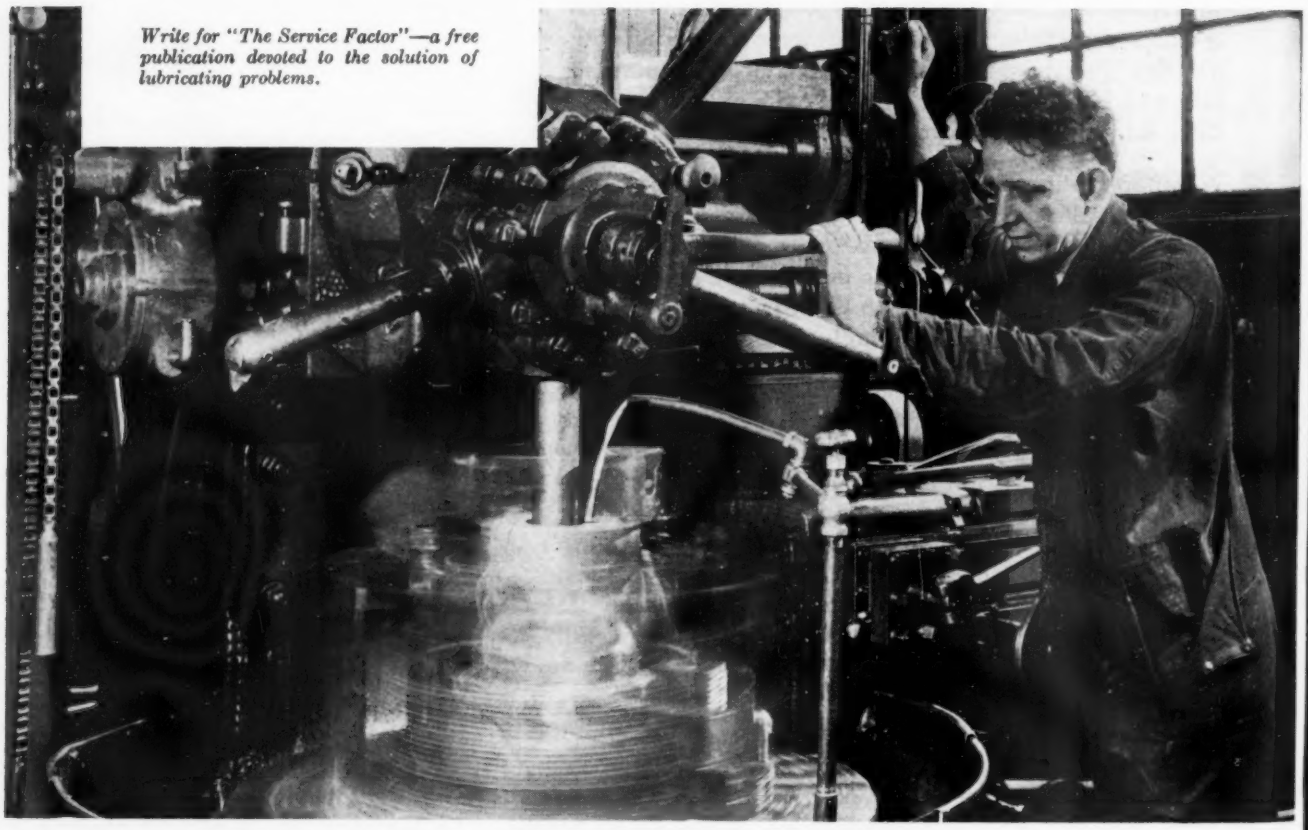
The American Pulley Company
PHILADELPHIA, PENNSYLVANIA



TOTAL WAR needs total production. For maintenance of peak output in *MACHINING* use . . .

. . . SINCLAIR CUTTING OILS AND COOLANTS. These oils are made for continuous high speed cutting on all precision work. They promote finer finish and faster output with fewer stoppages for tool regrinds.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.



SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE NEAREST SINCLAIR OFFICE

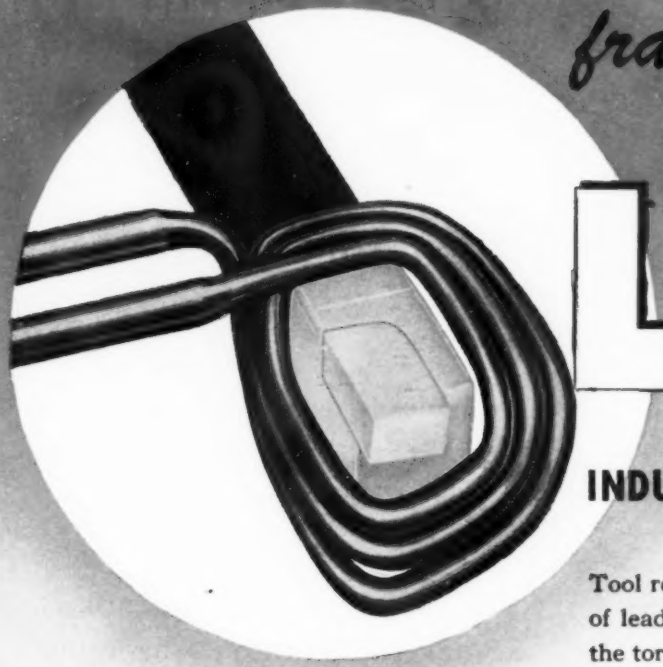
SINCLAIR REFINING COMPANY (Inc.)

2540 West Cermak Road, Chicago • 10 West 51st Street, New York City • Rialto Bldg., Kansas City • 573 West Peachtree Street, Atlanta • Fair Building, Ft. Worth

BRAZE
TUNGSTEN CARBIDE CUTTING TOOLS
faster, surer, at fractional cost

WITH

Lepel
HIGH FREQUENCY
INDUCTION HEATING EQUIPMENT



Brazing the LEPEL way is simple and sure even for inexperienced operators because the heating cycle is automatically controlled. Heating coils for various tool sizes and shapes are instantly interchangeable.

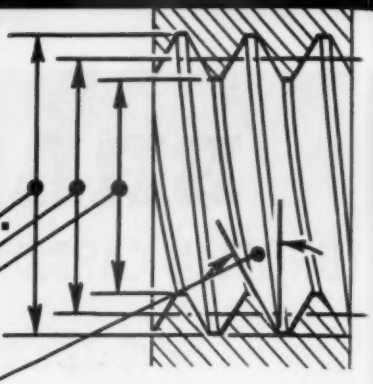
Tool rooms, everywhere, are following the example of leading cutting tool manufacturers in discarding the torch in favor of high frequency induction heating for brazing tungsten carbide cutting tips. For this simple modern method removes all uncertainty from the brazing operation. With the heating cycle *automatically controlled*, it assures uniform brazing, and uniformly *sure* bond between tip and shank, *every time*. It eliminates losses due to overheating . . . cuts brazing time . . . conserves precious machine hours and critical materials . . . and permits quick removal of worn tips without injury to tip or shank. And it is equally efficient for any type of brazing alloy.

A simple request will bring you complete information on LEPEL High Frequency Induction brazing . . . as well as on the adaptability of compact and economical LEPEL units for *Hardening, Annealing, Soldering* and *Melting*. Write or wire today.

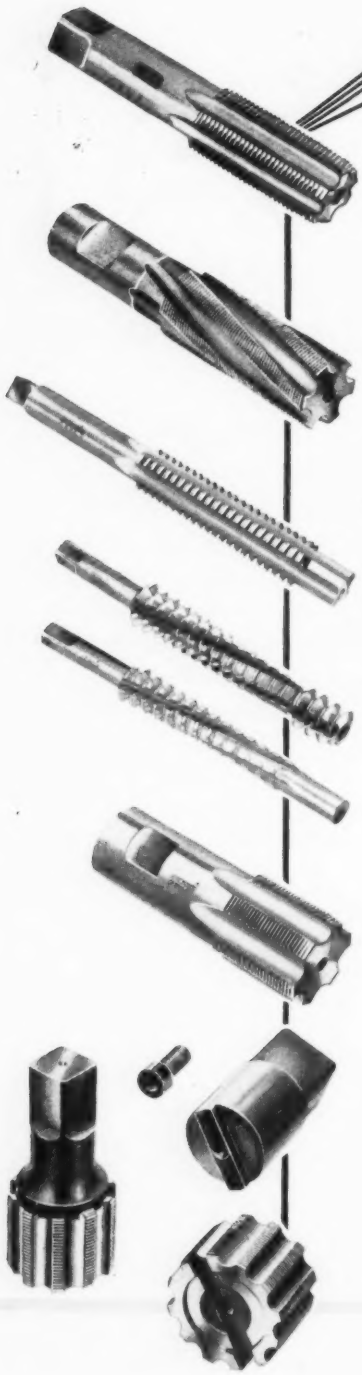
LEPEL High Frequency Induction Units are extremely compact, easily movable on casters, and relatively inexpensive. Operated manually, or, fully automatic. All other operations such as hardening, melting, soldering, etc. are performed by the same unit. Available in models for most industrial applications.

Lepel HIGH FREQUENCY LABORATORIES, INC.
39 West 60th Street, New York, N. Y.
PIONEERS IN INDUCTION HEATING

Cut these quickly, cleanly and accurately...



with these VARD precision taps



STRAIGHT FLUTE TAP in either Carbon or High Speed Steel. Accurately ground threads with deep flutes for fast precision threading. Furnished in commercial ground or precision ground grades.

SPIRAL FLUTE TAP used for fast cutting of SAE steels. Self cleaning and highly efficient on certain materials. Right or left hand flute.

ACME THREAD TAP cut in any length or thread form. VARD Acme Taps are always furnished to your specified tolerances.

ACME SETS for quick cutting of heavy threads in soft material like aluminum. First taps progressively shape the thread for final tap.

HEAVY DUTY TAPS of special steels and heavy shanks for fast cutting. Four to six flutes.

TWO PIECE TAPS with mild steel shank and Carbon or High-Speed steel cutting head. Conserves vital material. Adds strength and speeds work as cutters are interchangeable on the shank.

In completely temperature controlled departments, equipped with the newest and finest of production machinery, we turn out fine, accurate taps.

VARD Taps are ground by gage makers and are tested on gage testing instruments. We use our own taps in our own production plants making war materials. We design for high output.

Very few VARD Taps are carried in stock. We make taps to order to fit your exact need. If you will furnish us with your specifications we can give you our recommendations and delivery dates.

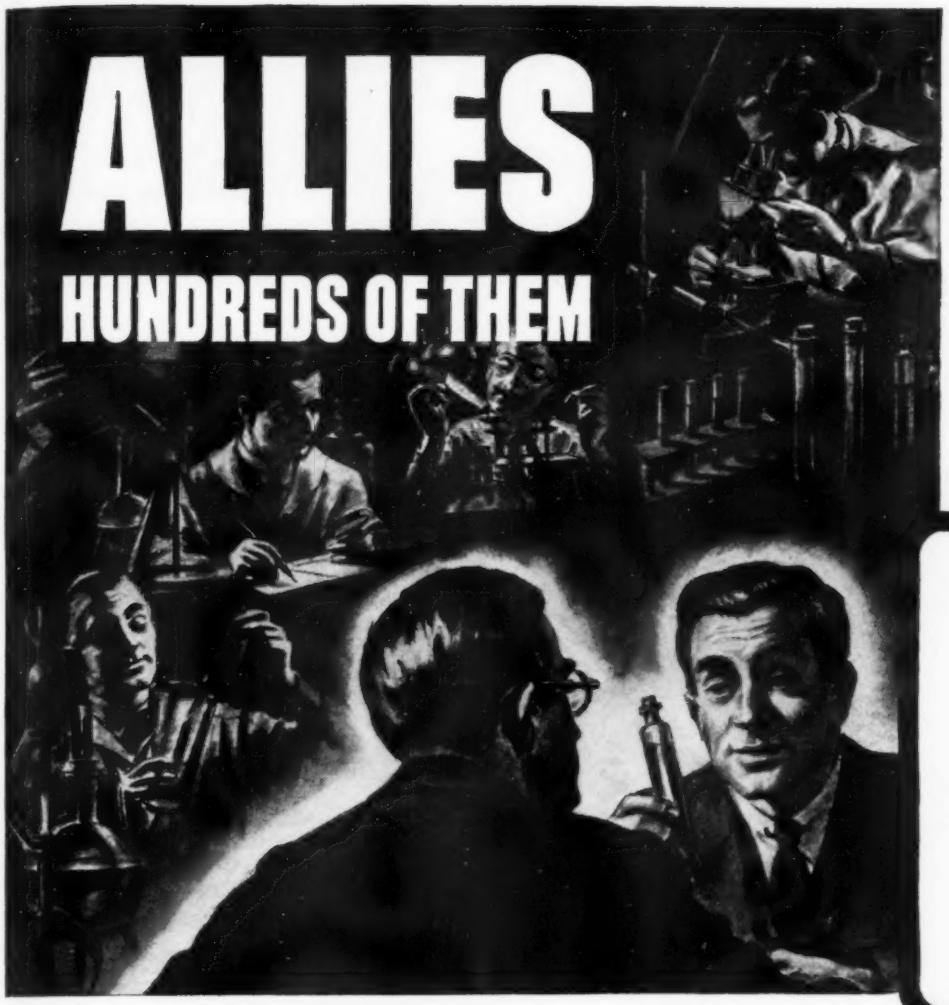
VARD INC.

PASADENA, CALIFORNIA

VARD PRODUCTS

- High Fidelity Mirrors
- Course Plotters
- Snap Gages
- Lathe Compounds
- Thread & Plug Gages
- Aircraft Geared Parts
- Aircraft Hydraulics
- Bench Model External Comparators
- Plain Tapered Ring Gages

ALLIES
HUNDREDS OF THEM



when you discuss industrial health with a West specialist

Because he brings with him the experience of hundreds of chemists, bacteriologists, industrial physicians, scientists, safety engineers and plant managers, who have contributed to making West one of the greatest organizations of its kind in the world.

★ ***Now,*** more than ever before, you need the most effective products to help combat occupational diseases. Your workers *must* be kept on the job. The Nation cannot afford needless loss of time. Lives of our fighting men overseas depend on production in war plants here.

*LAN-O-KLEEN—The Soap that Helps Keep Hands Healthy

● Lan-O-Kleen has *proven* its value in helping prevent occupational skin diseases in many of the largest war plants from coast to coast. Lan-O-Kleen is not only an effective cleaner that works mildly and without harsh chemical action—but it actually leaves the hands feeling better, more fit for work.

● Lan-O-Kleen is a powdered soap of *mildly* alkaline reaction compounded with granular corn-meal which has been impregnated (by an exclusive process) with LANOLIN, an oil almost identical to the natural oils secreted by the glands of the skin. Lanolin helps nature to maintain a normal, healthy skin condition.

● Help prevent occupational skin diseases with their resulting lost time accidents and slower production. *Investigate* LAN-O-KLEEN.

*Trade Mark Reg. U. S. Pat. Off.

55 BRANCHES • HELPING TO GUARD INDUSTRIAL HEALTH • COAST TO COAST

WEST DISINFECTING *Company*

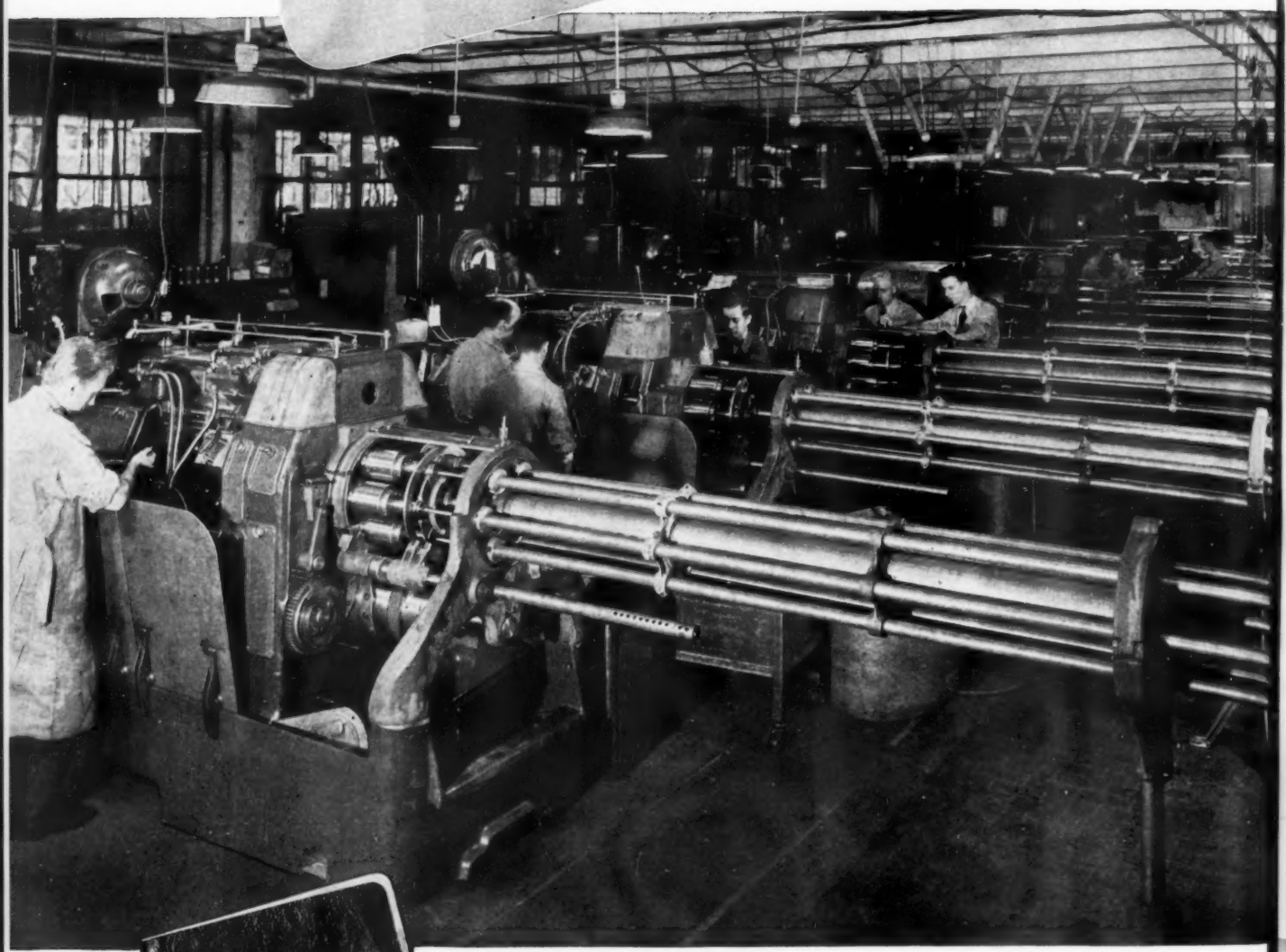
42-16 WEST STREET • LONG ISLAND CITY • N. Y.

CLIP TO YOUR BUSINESS LETTERHEAD, PLEASE

West Disinfecting Company, Dept. AM, 42-16 West St., L. I. C., N. Y. Please send me a SAMPLE QUANTITY of Lan-O-Kleen with which I will give your claim a practical test. Please include folder explaining its use.

Name..... Title.....

IF BESSEMER STEEL MEETS YOUR NEEDS



ARE YOU USING YOUR STEEL HANDBOOK NO. 42 TO HELP LICK "TOO LITTLE—TOO LATE"?

Thousands of copies of this gold mine of steel and machining information have been placed in the hands of machine tool users. In it is a vast amount of helpful information prepared to help you obtain maximum efficiency and a high percentage of perfect parts at lowest cost. Use your copy and its data on steel analyses, physical properties, heat treatment, recommended speeds and feeds for standard tools, spindle speeds, weight and area tables, stock estimating tables and other helps. If you do not have a copy and you are engaged in the machining of steel, write us for one.

Union Free Cut WILL HELP KEEP WAR PRODUCTION CURVES UP

Here's a Bessemer Screw Steel that keeps "automatics" running with a steady hum — day in and day out. Its consistent machining performance produces a steady stream of finished steel parts — at a rate of output which can be depended upon to keep war production curves up to the high levels so essential today.

UNION FREE CUT is an *ADVANCED* Bessemer Screw Steel — advanced by improvement after improvement resulting from more than half a century of machining research in laboratory and in parts producers' plants. It machines uniformly, bar after bar and shipment after shipment, with a fine, broken-up chip — produces a bright, smooth, machined surface.

Through reduction of abrasive elements that wear cutting edges, tool life has been substantially increased. Structure is uniform, as also are cyaniding or carburizing qualities which produce a hard, wear-resisting surface.

If your specifications can be met by the physicals of A.I.S.I. B1112 (S.A.E. 1112), you can achieve *and sustain* high production efficiency in the mass production of steel parts by using UNION FREE CUT.

If your equipment is capable of higher speeds, your selection probably will be UNION SUPERCUT (A. I. S. I. B 1113 — S. A. E. 1113) — the fastest-machining Bessemer Screw Steel made today. It provides the uniformity of machinability, fine machined finish and freedom from abrasive elements of UNION FREE CUT plus an increase in cutting speed to approximately 225 surface feet per minute.

Should your requirements, however, require the higher strength and the toughness of open-hearth or electric furnace analyses, you will find the same uniformity of properties, especially machinability, in these UNION COLD DRAWN STEELS.

Republic UNION COLD DRAWN STEELS are processed to provide the highest degree of machinability for each analysis. And Union Drawn metallurgists and engineers are ready to help you solve vexing machining and heat treating problems.

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Republic

UNION COLD DRAWN STEELS

Free-Machining Bessemer, Open-Hearth and Electric Furnace Steels
•
Union Cold Drawn Special Sections
•
Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting).

AT FOOD MACHINERY CORP.

SKILSAW TOOLS

RUSH AMPHIBIAN TANKS TO ACTION!

Official OWI Photo by Palmer

Alligator Tanks they call 'em . . . and they're wanted *quick* for rough, tough action on America's fighting fronts. That's why Food Machinery Corp. depends on SKILSAW TOOLS to speed production. Like the tanks they're building, SKILSAW TOOLS are *fast, rugged, dependable* . . . they're action-tested front-line fighters in the Battle of Production!

You'll find these SKILSAW TOOLS *preferred* in war plants everywhere because they're lighter, more compact for easier handling . . . more powerful for greater output per man on countless jobs. Ask your distributor to demonstrate SKILSAW TOOLS on your own work *today!* See how greatly these better tools will increase *your* production!

SKILSAW, INC., 5055 Elston Ave., Chicago

New York • Boston • Buffalo • Philadelphia • Cleveland
Detroit • Indianapolis • St. Louis • Kansas City • Atlanta
New Orleans • Dallas • Los Angeles • Oakland • Portland
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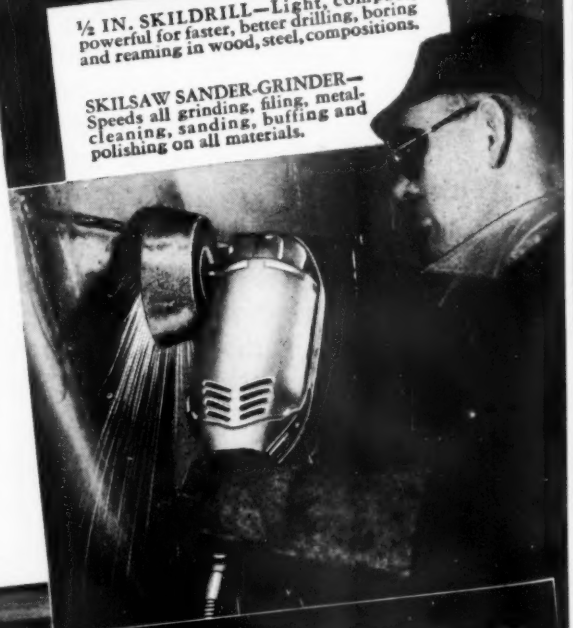
¼ IN. SKILDRILL—Handles like pointing a finger . . . gets in anywhere a fist will. Powered for top-speed, day-long drilling on production lines.

½ IN. SKILDRILL—Light, compact, powerful for faster, better drilling, boring and reaming in wood, steel, compositions.

SKILSAW SANDER-GRINDER—Speeds all grinding, filing, metal-cleaning, sanding, buffing and polishing on all materials.



SKILSAW PORTABLE ELECTRIC TOOLS

★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

STANDARD OIL ANNOUNCES

NEW Stanobar GREASE

For easier handling in grease guns ...longer life in anti-friction bearings

A war-bred grease for wartime jobs. Today's production pace demanded this new type grease. Longer hours of operation alone call for a more stable grease to resist heat and oxidation, while the need for more frequent lubrication of bearings makes an easily handled gun grease an asset.

Stanobar brings you both these advantages. It's a smooth (not fibrous) type grease. It contains inhibitors which reduce oxidation of both the soaps and oil in Stanobar. That means less cleaning of bearings and less labor and lubricant required to flush out old grease.

Stanobar resists thinning out when worked—that helps reduce leakage. It may also enable you to replace two or three grades of grease you are now using with this one grade of Stanobar.

Let a Standard Lubrication Engineer explain some of the other advantages of new Stanobar—and help you make a test. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you. In Nebraska, write Standard Oil Company of Nebraska at Omaha.

CHECK THESE ADVANTAGES OF NEW STANOBAR GREASE

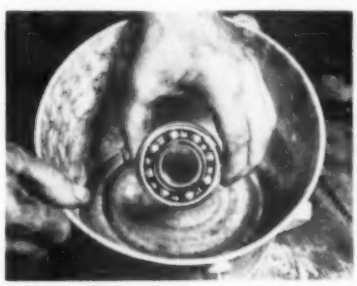
- . . . Easily handled in grease gun or pressure system.
- . . . Resists thinning-out when worked.
- . . . Does not oxidize and form deposits.

How to service ball and roller bearings. Proper packing of bearings after inspection is highly important. Bearings equipped with pressure fittings are sometimes replaced dry and filled with a grease gun, but a careful, hand-packed grease job is well worth the little extra time it may take. The illustrations at the right point out some of the steps to take.

OIL IS AMMUNITION . . . USE IT WISELY

Clean motor and bearing housing before removing bearing.

Remove bearing, wash it in kerosene, and dry thoroughly with a clean cloth.



Dip bearing in a light lubricating oil. Allow excess to drain before repacking.

Put grease only in depression of spacer (both sides). Then spin one of the races, and wipe off excess grease thrown out. Replace the bearing. Do not put additional grease in the bearing housing.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICA

ATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION EN

Use Stanicool Soluble Oil

HEAVY DUTY

. . . where a cutting oil doesn't cool enough

. . . where a soluble oil isn't tough enough

Have you some machining jobs where no cutting fluid seems to fill the bill? Where cutting oils can't carry away heat fast enough to prevent burning of work and tools? Where ordinary emulsified coolants don't give enough protection against tool wear, resulting in poor finish and frequent tool changes? Try Stanicool H. D.—a soluble oil designed for the "in-between" jobs.

A special compounding gives Stanicool H. D. a heavy-duty quality not ordinarily found in emulsified coolants. This combines the ability to prevent excessive tool wear with the natural cooling quality of a water emulsion in one oil, Stanicool H. D.

In addition, it has all the other desirable qualities of a soluble oil; it mixes easily, does not gum machines, is non-irritating to operator's skin, is stabilized against odor development, and has good anti-rust qualities.

Better finish on stainless steel. A typical job for Stanicool H. D. was found in machining stainless steel parts for surgical bone drills where a fine finish was important. The metal was smearing and burning with ordinary emulsified oils, regardless of the mixture tried. Stanicool H. D. not only produced a highly satisfactory finish, but also improved tool life substantially.

Call in a Standard Cutting Oil Specialist. He can tell you about other recent developments in cutting fluids that may help you solve a number of your machining problems. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you.

OIL IS AMMUNITION . . . USE IT WISELY

Other war-bred oils for wartime jobs

Stanicut 62 FC—A light-bodied, light-colored oil developed especially for machining tough aluminum alloys. It gives considerably better tool life and finish than kerosene and lard oil blends commonly used for machining such alloys. As it contains no active sulphur, it can be used for machining copper and brass. This eliminates changing oil when both aluminum and copper are worked on the same machine. The high flash point decreases the fire hazard.

★

Stanicut 107 BC is designed for high speed automatic work on free cutting steels. It can also be used on copper and brass, without danger of staining the work. It is also suitable as a coolant where carbide alloy tools are used.

★

Stanicut 126 BCS was developed for machining 1335 and similar steels lower in machinability rating than free cutting screw stocks. It gives excellent tool life.

★

Stanicut 155 SC—A transparent oil with high active sulphur content—it is giving excellent results on the tougher alloy steels, especially those that tend to "smear" and leave a poor finish with ordinary cutting oils.

★

Stanicut 309 BCS is designed for heavy broaching, threading and tapping soft steels or those which tend to tear easily. This oil is high in active sulphur, contains compounding, and acts as an anti-flux as well as a coolant.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

DEGREASE AND CLEAN ALL YOUR WAR PRODUCTS

...the fast, performance-proved OAKITE WAY

BEFORE painting, lacquering or applying black, corrosion-resistant finishes . . . or before spot-welding, electroplating, anodizing, tinning or galvanizing operations . . . you will find specialized Oakite alkaline, emulsifying, acid and solvent-type degreasing and cleaning materials provide the FAST, uniform, trouble-free results your war production schedule requires.

Used in automatic washing machines or tanks, these dependable Oakite materials keep rejects down, keep production lines flowing smoothly by thoroughly, speedily removing oil, grease, smut, soldering fluxes, polishing and buffing compounds and other deposits. See list below for types of war work on which Oakite materials are specified and used by prime and sub-contractors.

War-Time Oakite Service FREE!

Whether or not you are now using Oakite materials, all our facilities . . . our Nation-Wide Field Staff, our Chemical Research and Mechanical Engineering Laboratories . . . are freely available, day or night, to render helpful service on any war production degreasing or cleaning operation you want performed FASTER and EASIER! Your inquiries invited . . . no obligation.

IS THE WAR SUPPLY ITEM YOU ARE PRODUCING LISTED HERE?

Over 60 different Oakite materials are available that meet every production degreasing or cleaning specification on war orders. Prompt delivery assured from nearby warehouse stocks.

AIRPLANES
AIRPLANE MOTORS
FLIGHT INSTRUMENTS
AIRPLANE PARTS
BOMB FIN ASSEMBLIES
BOOSTER CAPS
FUZES & FUZE PARTS

POWDER BOXES
CARTRIDGE CASES
SHELLS
SHELL CASES
FLARE BOMB CASES
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INCENDIARY BOMBS

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MOTORCYCLES
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SCOUT CARS
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MATERIALS...METHODS...SERVICE
Buy Bonds for Victory
FOR EVERY CLEANING REQUIREMENT

Here's proof of the superior

TYPICAL EXAMPLES OF INCREASED PRODUCTION WITH GULF CUTTING OILS:

Gun Barrels... Consulted by a large ordnance plant on the possibility of obtaining greater production in the reaming of cartridge chambers in 1.1 gun barrels, a Gulf Lubrication Service Engineer recommended Gulf Electro Cutting Oil A. Result: production of reamed barrels increased 1500%—rejections reduced 50%.

•

37 Mm. Shot... A manufacturer of 37 mm. shot increased production 30%, reduced tool regrinds and down time for machine maintenance 50%, reduced cutting oil consumption 50%, and obtained better finishes on the work through the use of Gulf L. S. Cutting Base B blended with Gulf Cut-Aid.

•

Torpedo Gears... By using the cutting oil recommended by a Gulf Lubrication Service Engineer, a manufacturer of torpedo parts increased output 41%, improved finish, and reduced rejects in cutting Monel metal gear blanks.

Tank Tread Pins... A manufacturer of tank tread pins increased production per tool dressing from 85 pieces to 600 pieces by using Gulf Lasupar Cutting Oil C.

•

Artillery Recoil Cylinders... By using Gulf L. S. Cutting Base A, a large ordnance plant increased production 30%and increased tool life 300% in machining operations on hardened nickel chrome steel forgings for artillery recoil cylinders.

•

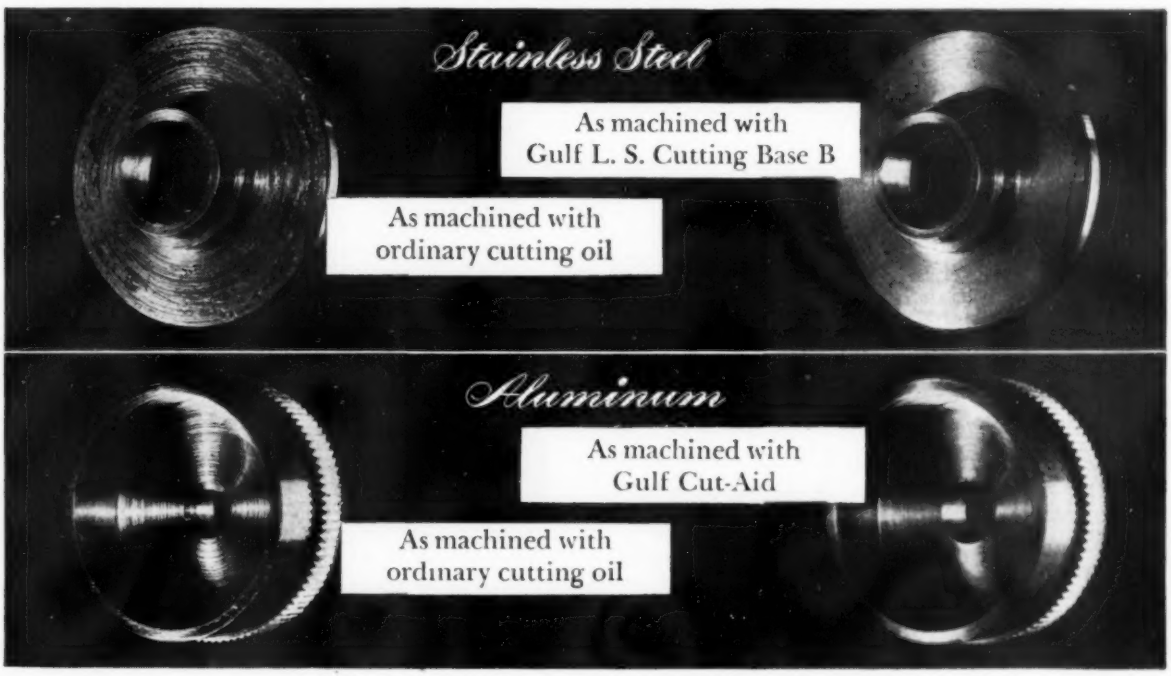
Bomb Striker Nuts... Consulted by a manufacturer of steel striker nuts for bombs on the problem of 100% rejection of production due to torn threads in a tapping operation, a Gulf Lubrication Service Engineer recommended Gulf Lasupar Cutting Oil A and a suitable level on the end of the tap. Result: rejections entirely eliminated, production greatly increased.

GULF INDUSTRIAL LUBRICATION

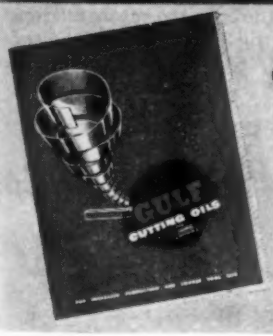
As a result of proven performance, over a thousand plants with difficult machining operations have adopted Gulf Cutting Oils during the past six months. Here's the record of improved machining practice in these plants: Production increased as much as 300%, tool life increased as much as 2000%, and marked improvements in finish. Write or 'phone your nearest Gulf office today for effective help on *your* machining problems.

performance of Gulf Cutting Oils

TYPICAL EXAMPLES OF IMPROVEMENT IN FINISH WITH GULF CUTTING OILS:*


Stainless Steel
As machined with Gulf L. S. Cutting Base B
As machined with ordinary cutting oil
Aluminum
As machined with Gulf Cut-Aid
As machined with ordinary cutting oil

*Unretouched photos. Cutting conditions the same in each comparison.



A.M.

Gulf Oil Corporation · Gulf Refining Company
3800 Gulf Building, Pittsburgh, Pa.

Please send me, without obligation, a copy of the new booklet, "Gulf Cutting Oils," which includes a 24-page Machining Guide.

Name.....

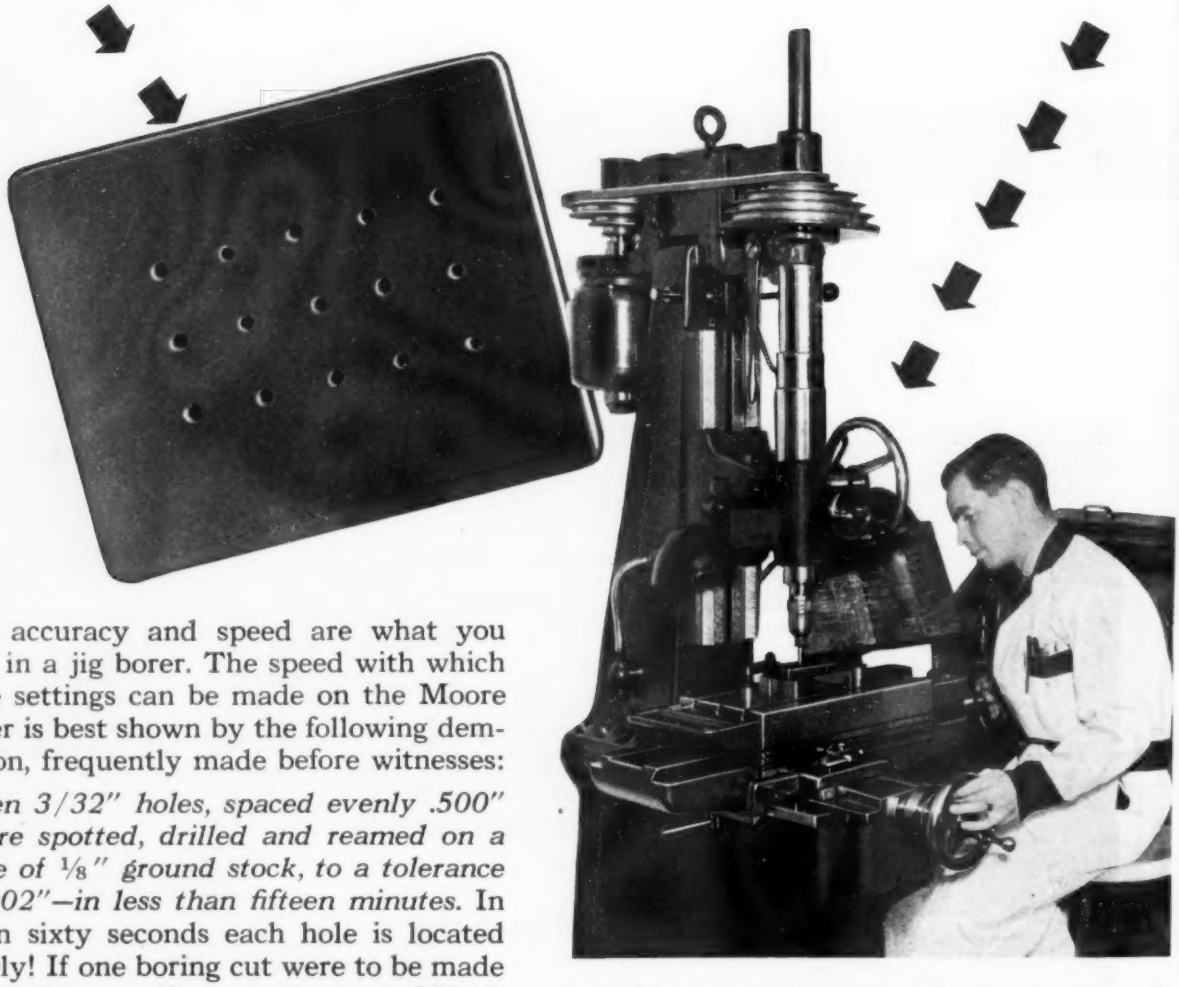
Company.....

Title.....

Address.....

15 holes in 15 minutes!

WITH THE MOORE JIG BORER



Greater accuracy and speed are what you look for in a jig borer. The speed with which accurate settings can be made on the Moore Jig Borer is best shown by the following demonstration, frequently made before witnesses:

Fifteen 3/32" holes, spaced evenly .500" apart, are spotted, drilled and reamed on a template of ⅛" ground stock, to a tolerance of ±.0002"—in less than fifteen minutes. In less than sixty seconds each hole is located accurately! If one boring cut were to be made in order to increase the accuracy to ±.0001", the time for all fifteen holes would be increased by only five minutes.

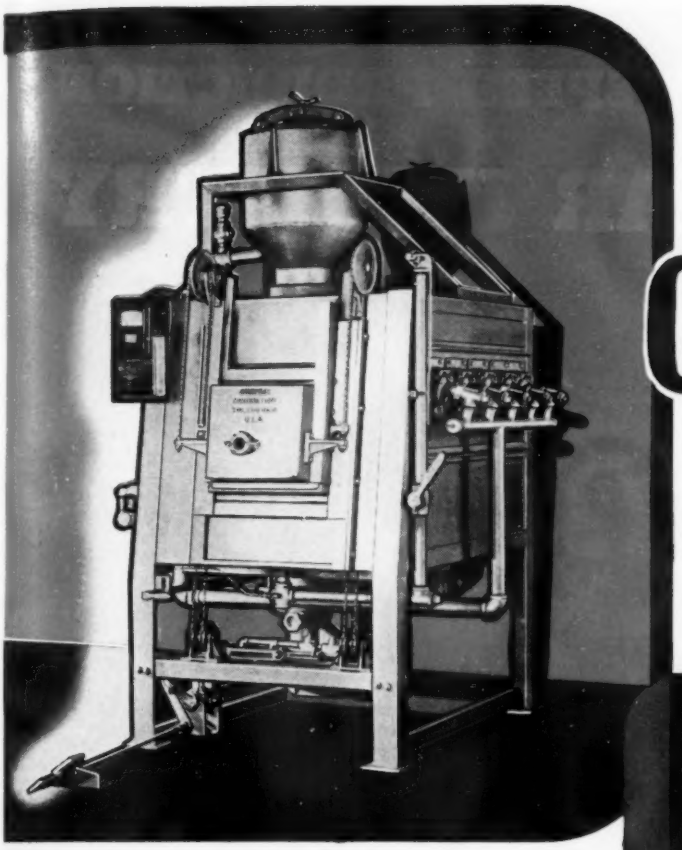
We do not believe that a similar performance is possible with any other type of jig borer. This unprecedented combination of accuracy and speed is the result of lead screws produced by us under the most advanced methods and ground to a degree of precision never achieved before. They enable the most efficient application in the Moore Jig Borer of the fundamental Coordinate Location System. By means of the two lead screws, working at right angles to each other, the workpiece may be moved into any desired position in relation to the fixed spindle. The operator can set the table instantly and check himself without fear of error.

PARTNERS IN PRODUCTION... *The Moore Jig Grinder* corrects hole distortions after hardening. Among its many operation features is the means of rapid location described above for the Jig Borer. Learn how these two machines will modernize your toolroom operations. Send for illustrated literature *today*.

Manufactured by* MOORE SPECIAL TOOL CO., INC · *Bridgeport, Conn.

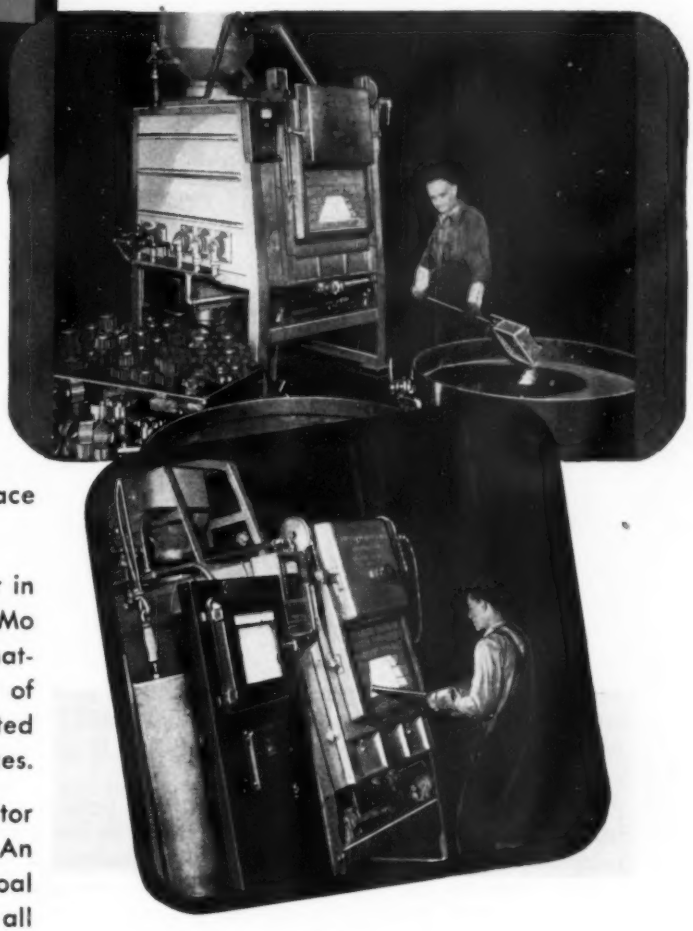
MOORE TOOLS

EXCLUSIVE DISTRIBUTORS: MARBURG BROTHERS, INC · 90 WEST STREET, NEW YORK, N.Y.



Surface CHAR-MO

SAFE, SIMPLE ATMOSPHERE FOR SENSITIVE STEELS



NO SCALE • NO DECARB • NO SOFT SKIN

★ The operation of the Surface Char-Mo Furnace atmosphere generator is simple. All that is necessary is to load charcoal hopper, control air flow by one valve and remove ash by means of simple grate mechanism. Composition of atmosphere is automatically controlled by the furnace temperature.

★ Incorporation of atmosphere generator in the heating chamber of the Surface Char-Mo Furnace reduces equipment cost by eliminating a separate generator and extra set of temperature controls. There are no complicated meters . . . no elaborate proportioning devices.

★ Fuel consumption is low because generator is built into same unit as furnace muffle. An average of three to five pounds of charcoal (any local commercial source) per hour is all that is required to generate the atmosphere.

SURFACE COMBUSTION • TOLEDO, OHIO

Bulletin CM-42, now available, gives complete operating data and specifications. Write for your copy. H3

Surface Combustion

INDUSTRIAL FURNACES • JANITROL GAS-FIRED SPACE HEATING EQUIPMENT • KATHABAR MOISTURE CONTROL SYSTEMS

McKAY ELECTRODES SPEED PRODUCTION IN EVERY WAR INDUSTRY

War and *necessity* are one . . . and necessity is the "mother of invention."

When war demanded new conceptions of production, *revolutionary applications of welding* were "invented" to meet the need.

In no small measure McKAY Shielded-Arc Electrodes contribute to the total accomplishment.

For it is only natural that a manufacturing policy, which merited the title "the researched line," should likewise rise to meet the requirements of this emergency. Thus new analyses, new coatings, new sizes, new ranges of adaptability . . . plus ever growing volume . . . have caused McKAY Electrodes to help speed production in every type of war industry.

THE McKAY COMPANY · PITTSBURGH, PA.

PACIFIC COAST SALES OFFICES: 125 S. Santa Fe Ave., Los Angeles · 100 Howard St., San Francisco

The McKay line includes regular carbon steel, stainless, and alloy steel electrodes for every welding purpose. Literature on request.

Among the first honored with the Navy "E", The McKay Company is proud of the broader award of the Army-Navy "E".

McKAY WELDING ELECTRODES

AND INDUSTRIAL, MARINE AND AUTOMOTIVE CHAINS

"KEEP ON BUYING U. S. WAR BONDS"

JOHNSON BRONZE **Ledaloyl** SELF LUBRICATING REG. U.S. PAT. OFF. POWDER METALLURGY

Over 2000 Stock Sizes . . . enable you to make a further saving in time and money. Write for our new catalogue.

The BEARING *that* LUBRICATES *itself*

Oil is the life blood of every motive unit. In order to gain smooth, quiet operation; long, satisfactory bearing life, we must have the right amount of oil . . . in the right place . . . at the right time.

Johnson LEDALOYL bronze bearings provide this type of performance. Evenly distributed over all surfaces of every LEDALOYL bearing are millions of tiny, evenly spaced pores. Each of these pores serve as miniature oil reservoirs. Heat, generated by the turning of the shaft, draws the oil from the pores into the bearing area. Thus, a thin, protecting film of lubricant separates the shaft from the bearing, reduces friction to a minimum and assures long, satisfactory life. When the shaft stops, the oil is absorbed by the bearing.

Johnson LEDALOYL Bearings are ideal for any place where lubrication is hard to achieve, likely to be neglected, or where excess oil might damage goods in process.

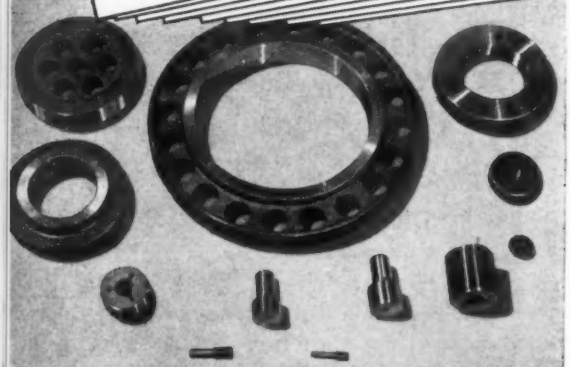
Johnson LEDALOYL Bearings will help you simplify your designing problems . . . cut your installation costs. Before you start on a new design, get the facts regarding LEDALOYL. A Johnson Engineer will gladly review your applications at your convenience. As we manufacture ALL TYPES of Sleeve Bearings, he will base his recommendations strictly on facts . . . free from all prejudice. Why not call him in . . . TODAY?

JOHNSON BRONZE
SLEEVE BEARING HEADQUARTERS
515 S. MILL STREET NEW CASTLE, PA.

The MOST COMPLETE SLEEVE BEARING SERVICE *in the* WORLD

HOW TO "Freeze" DIMENSIONS ON GAUGES AND PRECISION PARTS

COMPANY NAMES STARTING WITH P*
increased production
Case Study from the Files of Deepfreeze
The Sub-Zero Method
of Shrinking, Testing and Treating of Metals
*Name on request to bona-fide inquiries



Typical gauges subjected to alternate cold and heat treating

DATA AND PART INFORMATION

Season gauges to prevent change in finished size.

Thread gauge treated as follows: 2 hours Deepfreeze—2 hours boiling water—2 hours Deepfreeze.

Other gauges treated according to gauge and steel. Some are heat treated one or more times or normalized between machining operations. Size determines number of Deepfreeze applications—larger gauges chilled more than once.

Sequence of Operations on Thread Gauge:

1. **Machined, heat treated and rough ground.**
2. **Deepfreeze and heat treat.**
3. **Finish by lapping.**

RESULTS: Gauges held size in transit to customer's plant—no rejects.

SAVINGS: All time previously lost in correcting or replacing gauges whose size was distorted due to temperature changes and jarring.

FREE ADDITIONAL DATA . . . and proof of the outstanding success of the Deepfreeze method for chilling metals are included in this booklet. Write for *your* copy.

Operator Inserting Gauges in Deepfreeze Unit

Customers of Gauge Manufacturer Now Receive Gauges With Exact Dimensions as Shipped

This prominent manufacturer of gauges experienced difficulty in preventing growth or change in size of gauges during shipment to customers, and during later use in customers' plants. Jarring and temperature changes in transit affected finished gauge size and hours of careful work were wasted. When gauges were not distorted in transit, future metal growth and warp resulted in spoiled work in the customer's plant.

Alternate Cold and Heat Treating Assures Correct, Permanent Size

With the installation of Deepfreeze Industrial Chilling Equipment, together with usual heat treating, the gauges are now properly treated to hold finished size under all normal temperature changes and handling.

Gauges are stored 2 hours in Deepfreeze unit, then in boiling water, oil, or salt bath depending upon steel used, and then back to Deepfreeze storage for 2 additional hours.

The Uses of DEEPFREEZE in Your Plant

In addition to preventing growth or warp in gauges and precision parts, Deepfreeze metal chilling can help you in:

1—Shrinking of metals for ease of bearing assembly, etc.

2—Testing of metals for reaction of sub-zero temperatures to aircraft instruments, etc.

Investigate the full possibilities and application of Deepfreeze to your manufacturing . . . write for the booklet offered at the left.

Deepfreeze
DIVISION

MOTOR PRODUCTS CORPORATION
2327 DAVIS ST., NORTH CHICAGO, ILLINOIS

THE THREAD GRINDING OIL THAT'S GETTING 13¼ HOURS PRODUCTION DONE . . . IN AN 8 HOUR SHIFT

EXCERPT from unsolicited Letter

"MARATHON C-6 GRINDING OIL STEPPED UP OUR PRODUCTION FROM 3 PER HOUR TO 5 PER HOUR IN GRINDING PROPELLER SHAFTS—WITHOUT SMOKE OR FOG."

Figure it out for yourself . . . here's a plant that's getting 66% boost in production (when it comes to grinding propeller shafts) simply by switching to Marathon C-6 Grinding Oil.

And you'll see *why* the minute you put it on the job. For Marathon C-6 is clean, does not gum up machines. And because it operates at lower working temperatures, it means greater accuracy, less spoilage, longer tool life.

Ask an Ohio Oil Company Lubrication Engineer to specify cutting and grinding oils that will boost production, save time, cut costs throughout your plant. Phone, write or wire.

ATTENTION . . . USERS OF EX-CELL-O, JONES & LAMSON AND LANDIS PRECISION THREAD-GRINDING MACHINES: You'll find we have a superior grinding oil for use in your machines, regardless of the metal being worked . . . aluminum, bronze, brass or steel.

THE OHIO OIL CO.

General Offices: Findlay, Ohio • District Offices: Robinson, Ill., Indianapolis, Ind., Louisville, Ky.

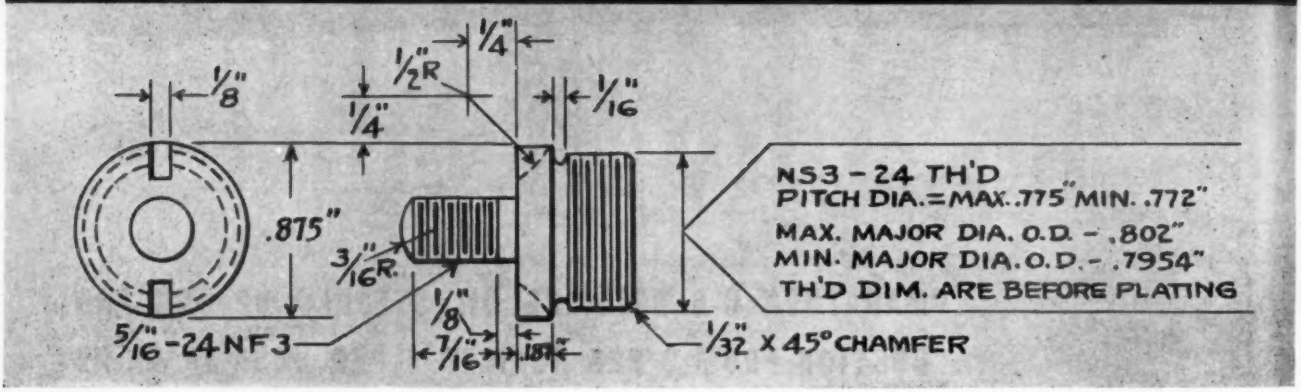
MARATHON

PRODUCERS OF PETROLEUM SINCE 1887

TANTUNG

THE MIRACLE METAL

COMPARATIVE PERFORMANCE SHOWING THE ADVANTAGE OF USING TANTUNG IN SCREW MACHINE OPERATION



NAME: PLUG
MATERIAL: S.A.E.-120

MACHINE: CLEVELAND AUTOMATIC and *W&S #4 COOLANT OIL

Operation: TURN, FORM, THREAD
THREAD, CUT OFF

TOOLING	ACTUAL TIME	PIECES PER HOUR	COST PER 100 PIECES	SPEED
*HIGH-SPEED STEEL	3.55	16.9	$5.92	320
HIGH-SPEED STEEL AND TANTUNG	2.85	21.0	4.76	560
TANTUNG	1.55	38.7	2.58	800

NOTE—Tantung shows its unquestioned superiority over high-speed steel. Analysis shows when Tantung tools were used exclusively—PRODUCTION was more than doubled—129%—TIME—more than halved—55.7%—COST cut more than in half—56.4%.

Tantung is not a substitute for carbides. Use where carbides cannot be used. Tantung is a hard, tough, cast, non-ferrous alloy. Its efficiency and outstanding performance is made possible by the inclusion of tantalum carbide. Send for Tantung Performance Data Book.

TANTUNG • ECONOMY • ALL PURPOSE • CUTTING OFF • SPECIAL TOOLS • SOLID TOOL BITS • MILLING CUTTER BLADES

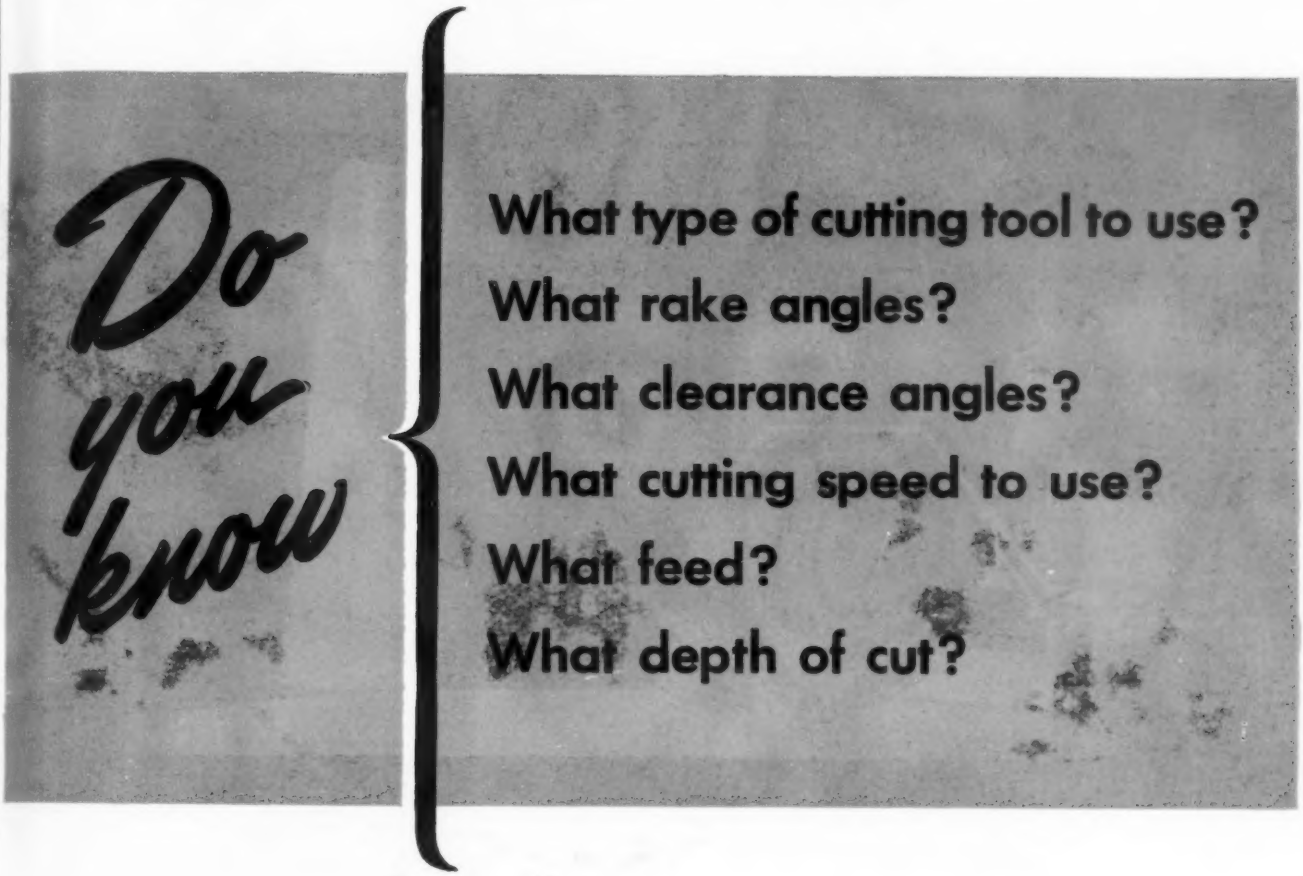
4313

Ramet

VASCOLOY-RAMET CORPORATION

NORTH CHICAGO, ILLINOIS • DISTRICT SALES AND SERVICE IN PRINCIPAL CITIES
IN CANADA: CARBIDE TOOL AND DIE COMPANY, LTD., HAMILTON, ONTARIO

When machining Copper, Brass, Bronze or Nickel Silver • • •



This 32-page ready-reference machining manual has the answers—on turning, parting, forming, drilling, reaming, tapping, threading and milling—for more than 40 copper base alloys, from free cutting yellow brass all the way to copper and the tough bronzes. It also contains tables of compositions, physical constants, physical properties, convenient weight tables and references to Standard Specifications.

To get the most out of your machining operations, write for a copy now. Ask for Anaconda Publication B-3 "Machining Copper and Copper Base Alloys". No obligation, of course.

ANACONDA

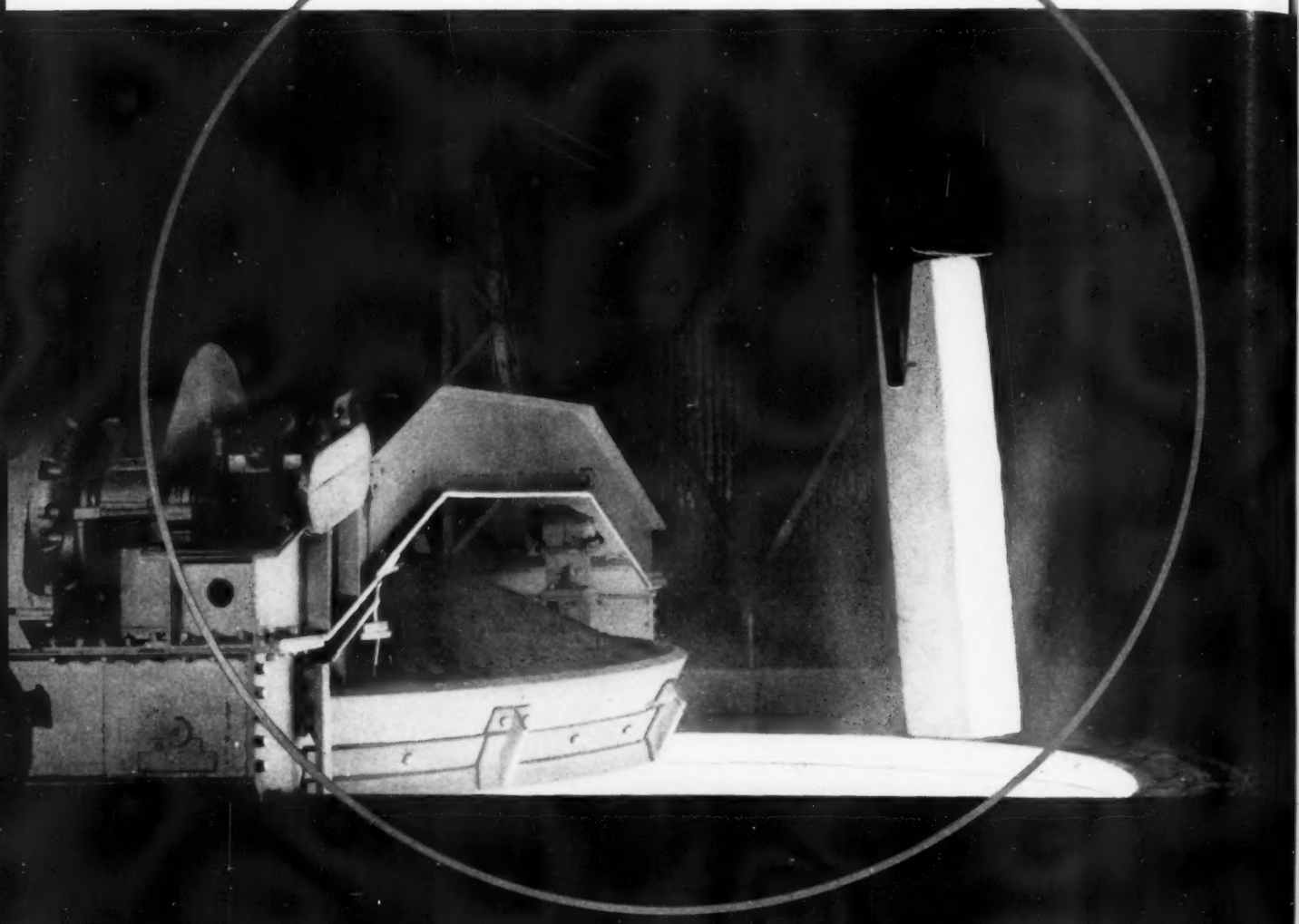
43160

Anaconda Copper & Brass

THE AMERICAN BRASS COMPANY, General Offices: Waterbury, Connecticut

Subsidiary of Anaconda Copper Mining Company • In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

Salem Circular Soaking Pits



BIGGER PRODUCTION · HIGHER YIELD · BETTER STEEL

SALEM SOAKING PITS are in reality circular shaped Ingot Heating Furnaces. They heat cold or hot carbon steel or alloy ingots 25% faster, while at the same time they prepare ingots better for first-class rolling at lower cost. Production data also reveals a 25% increase in tonnage. More accurate control of ingot temperatures than with other types permits a 1% reduction in scale formation PLUS a 1% increase in yield. . . . .

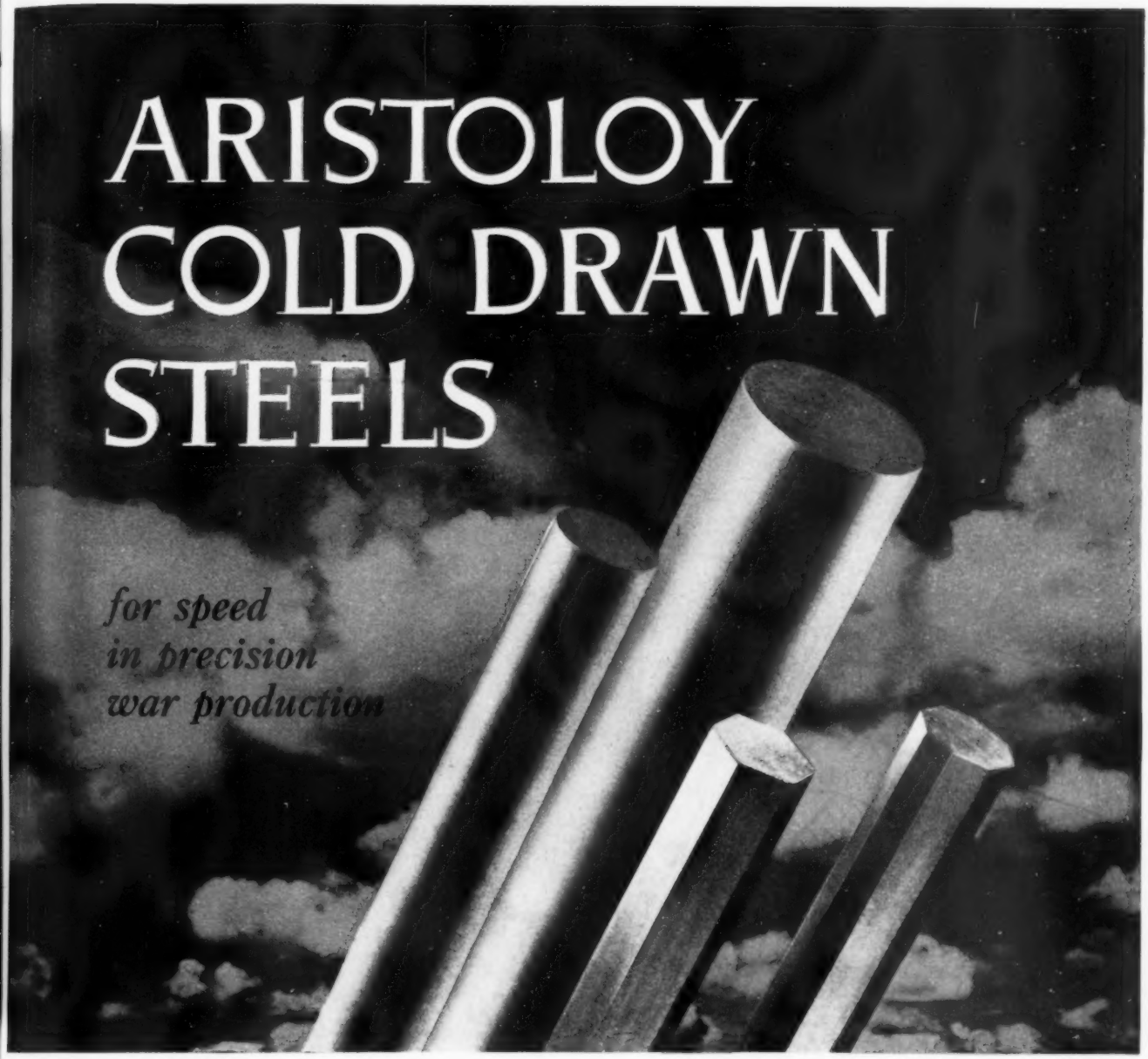
Being of circular shape and having NO FORGOTTEN CORNERS AND NO COLD POCKETS, Salem Pits not only heat more ingots per square foot of occupied floor space than do the square or rectangular pits, but they also heat them MORE UNIFORMLY. Heat is obtained from a multiplicity of oil or gas burners and the hot gases enter the pit at a tangent to the circular wall of the furnace which causes the gases to follow a circular path. Thus, the hot gases are in contact with the ingots for a longer period with relatively low burner velocity. Furthermore, there is no flame impingement on the furnace wall or the steel, and all ingots are heated uniformly from top to bottom. Salem Circular Pits are built in all sizes to meet any production or building requirement. Remember, too, that the world's largest pit is of Salem design. Write today for more comprehensive facts.

SALEM ENGINEERING COMPANY

SALEM ENGINEERING CO. · SALEM, OHIO

ARISTOLOY COLD DRAWN STEELS

for speed in precision war production



Cold Drawn Steels have the vital wartime job of keeping fast automatic production machines operating continuously at peak loads. The uniform surface and close tolerance of Aristoloy Cold Drawn Steels assure smooth machining with longer tool life and uninterrupted production.

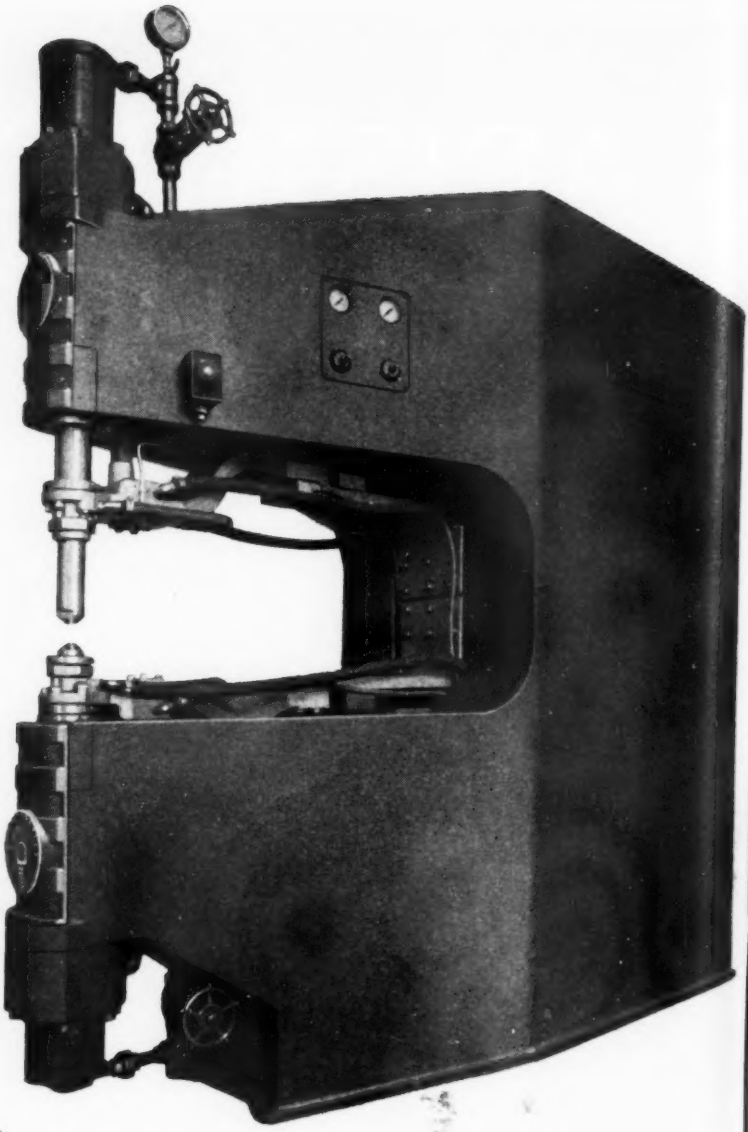
COPPERWELD STEEL COMPANY
WARREN, OHIO

ARISTOLOY STEELS

TO BUILD MORE • • • BETTER • • • FASTER

Carbon Tool Steels • Aircraft Quality Steels • Nitralloy Steels • Alloy Tool Steels • Stainless Steels • Bearing Quality Steels • Cold Drawn Steels

FOR SHIP-BUILDING—The "Temp-A-Trol" welder (right) has a maximum throat depth of 44 inches. It will handle the heat-treated welding of plates far beyond the thickness ordinarily considered practical for spot-welding.



The Newest thing in Welding

"TEMP-A-TROL"

- **Combines resistance welding and heat-treating of welds**
- **Automatic thermo-couple control of weld-cycle**
- **Ideal for heavy sections and alloy steels**

Send for Bulletin No. 301 on your company letterhead for complete information

The self-compensating "Temp-A-Trol" will weld a series of different sections like this without changing the machine setting.

PROGRESSIVE WELDER CO.

SEAM PROJECTION & BUTT . . . *Electric Welding Equipment* . . . PORTABLE GUN & PEDESTAL

3050 E. OUTER DRIVE • DETROIT, U. S. A.

BRONZE BEARING SERVICE GEARED TO WAR NEEDS

● Bunting Bronze Bearing Service provides the speed, efficiency and quality of product that meet war-time requirements for machinery production and maintenance. Ready-for-assembly Bunting Bronze Bearings for machine tools, electric motors and all kinds of industrial equipment are available from stocks maintained in all principal cities. Factory-finished Bunting Bearing Bronze Bars in hundreds of sizes save metal, time, labor, tools in machining operations. Ask your wholesaler. Write for catalog. The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.

Bunting

BRONZE BUSHINGS • BEARINGS • PRECISION BRONZE BARS

For 8 years I slept in the print room

FUNNY HOW YOU GET SO in the habit of doing a job one way—year after year.

Take my case. I thought the best way to reproduce an engineering drawing was to blueprint it. Then . . . bang! Along came the war . . . and our draftsmen were the first to howl. They blamed their "behind schedule" record on our print-making equipment.

THAT'S WHEN I WOKE UP.

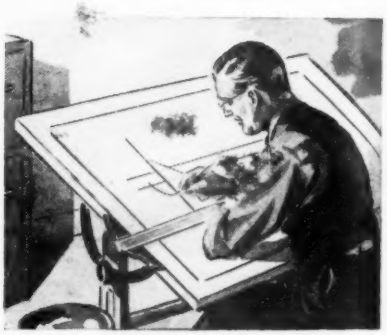
I learned all about the Ozalid Process . . . how it had been on the market since 1935 . . . how we had been missing its advantages in the print room, drafting room, and in the shop. But, you can bet we're not missing them now.

Here is what the Ozalid Process is doing for us . . . and can do for you:

1 An Ozalid whiteprint machine turns out positive reproductions of engineering drawings, charts, letters, in two fast steps—Exposure and Dry Development. The machine is clean, compact . . . and any inexperienced person can be quickly trained to operate it at top efficiency. There are no liquid baths, no plumbing connections—no daily tasks which demand "specialists."

2 With the Ozalid Process you can make prints which will have blue, black, or maroon lines on a white background. The maroon line is recommended for the shop since it shows the greatest contrast to grease and dirt . . . and will stand up better than the white line of a blueprint.

3 You make duplicate originals the same way you produce standard prints . . . there are no "Van Dyke" tieups. These duplicates may be used in place of valuable originals in subsequent print production.



4 In addition, Ozalid duplicates are "First Aid" for overworked drafting departments. When the design of an original tracing is to be changed (a) an Ozalid duplicate is made (b) the obsolete lines are eradicated with Ozalid Corrector Fluid (c) the new lines are drawn in. It's that easy! It's never necessary to redraw any line which remains the same as in the original.

5 All Ozalid sensitized materials are available in cut sheets as well as roll stock. Thus, by using sheets which correspond in size to your original, you can completely eliminate trimming waste.

OZALID PRODUCTS DIVISION

GENERAL ANILINE AND FILM CORP.

Johnson City, N. Y.

For complete information, write for SIMPLIFIED PRINTMAKING. It shows how leading manufacturers save time, labor, and materials with the Ozalid Process.

ANNOUNCING--AFTER 30 MONTHS OF DEVELOPMENT--

the only complete line of motors in which all types in any one frame size are interchangeable and similar in appearance!

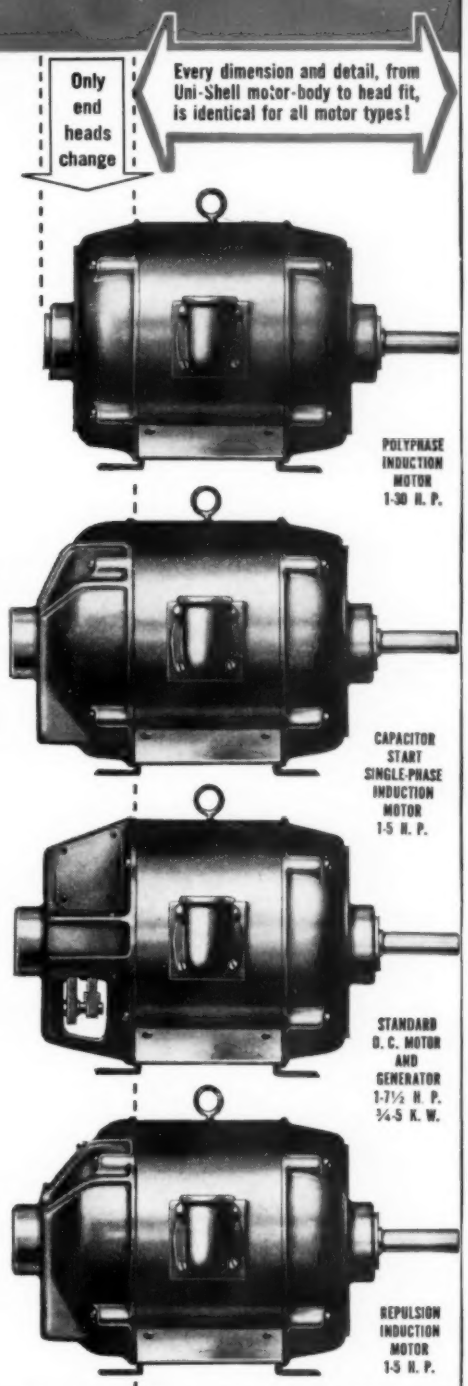
ROBBINS & MYERS *Uni-Shell* MOTORS

Here's one of the biggest improvements in electric motors in years! Greater interchangeability of *all motor types* than has ever been known before!

Within cylindrical shells of steel we are building not only the finest line of motors we've produced in nearly 50 years, but motors that—for any one frame size—have *identical* shell dimensions, head fit, bolt circle holes, base, shaft size, and conduit box mountings. Where one type of Uni-Shell Motor can be mounted, so can any!

In development for 30 months, and thoroughly tested and proved in hundreds of grueling war-production applications, R & M Uni-Shell Motors embody many other improvements, too, that contribute to longer life, greater dependability, and higher efficiency. New insulating techniques, combined with the finest materials obtainable, keep interior temperatures *below* guaranteed minimums. Better bearings and better balancing assure unusually smooth, trouble-free operation. And we have utilized our broad fan-building experience to make interior ventilation better than ever.

Whether you use motors as part of your product, or only on the machines in your plant, the advantage of *interchangeable motor types* is obvious. The other advantages offered by Uni-Shell Motors will be obvious, too, when you know the whole story. Read the back of this page and then mail the coupon for *your* copy of our 20-page, fully illustrated booklet!


Only end heads change
Every dimension and detail, from Uni-Shell motor-body to head fit, is identical for all motor types!
POLYPHASE INDUCTION MOTOR 1-30 H. P.
CAPACITOR START SINGLE-PHASE INDUCTION MOTOR 1-5 H. P.
STANDARD D. C. MOTOR AND GENERATOR 1-7½ H. P. ¾-5 K. W.
REPULSION INDUCTION MOTOR 1-5 H. P.

ROBBINS & MYERS, INC.

SPRINGFIELD · OHIO

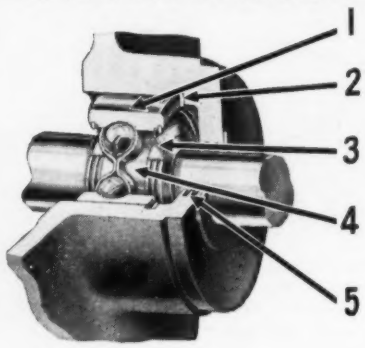
HOISTS & CRANES · MACHINE DRIVES · FANS · MOYNO PUMPS · FOUNDED 1878

TURN PAGE for More Details!

3 OTHER IMPORTANT FEATURES

MAKE ROBBINS & MYERS *Uni-Shell* MOTORS OUTSTANDING!

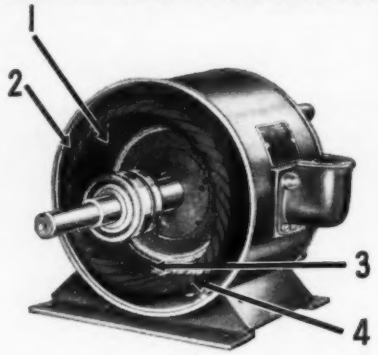
1. BETTER BEARINGS



1. Double-row-width ball bearing assures an adequate supply of lubricant. **2.** Spacing washer. **3.** Complete seal, both sides—held in by snap rings that are easily removed for inspection, cleaning and regreasing. The lubricant sealed in—dirt sealed out! **4.** Exceptionally large grease reservoir. **5.** Annular grooves filled with water-resistant grease to exclude water, dirt, fumes and other foreign matter.

One of the two main reasons for motor deterioration is *bearing wear.* That is why we have gone "all out" on bearing standards, types, and alignment for Uni-Shell Motors. The bearing illustrated above is standard on all Uni-Shell ball-bearing motors. Equally important improvements have been made on sleeve bearings for Uni-Shell Motors requiring them. Highest-quality cast bronze bearings, with surfaces burnished to a high finish, are used in both wool-packed and ring-oiler types.

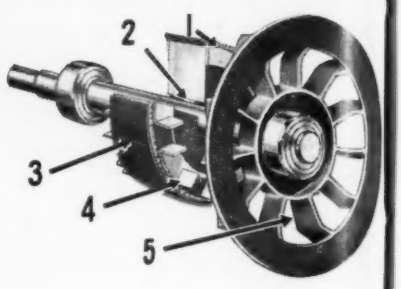
2. BETTER INSULATION



1. Two layers of highest-grade impregnated rag paper. **2.** Wire itself coated with double-weight synthetic resin for strength and flexibility. **3.** Added sheet of impregnated paper placed between coils in slot. Improved method used for holding end coils. **4.** Entire winding assembly given several baked coats of synthetic resin-base varnish and covered with moisture-resistant synthetic resin and tung-oil sealer.

The second main reason for motor deterioration is two-fold: *poor insulation* and *excessive heat.* Consequently, throughout Uni-Shell Motors, we use the best insulating materials that can be purchased, incorporating the newer synthetic varnish treatments as outlined above. On all heat runs, temperature rise is measured by embedded thermo-couples to give the complete, *accurate* picture for each design. Heat vitally affects motor life. Our records show that Uni-Shell Motors give *better* than guaranteed values.

3. BETTER BALANCE and ROTOR CONSTRUCTION

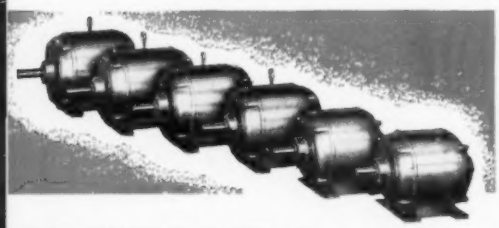


1. Welded or brazed bars and end rings are copper. **2.** Rotor keyed to shaft. **3.** Ground rotor surface assures uniform air gap and quiet operation. **4.** Pressed-steel fans are used against rotor for larger ratings, as well as on totally enclosed motors. **5.** Our fan engineering experience has been applied to designing and testing all fans used in the Uni-Shell. A measured flow of air is assured on all designs.

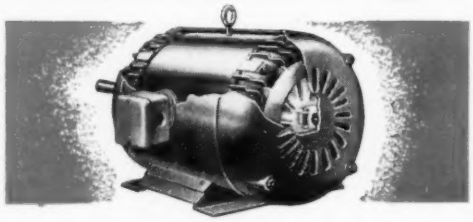
Good bearing alignment and rotor construction, together with precision balancing, prevent motor vibration that injures bearings and shortens their life. Three grades of rotor balance are available on all types of Uni-Shell Motors:

1. Static balance.
2. Commercial dynamic balance.
3. Special dynamic balance.

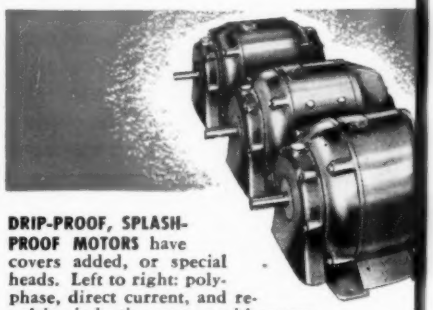
Precision balancing machines of the newest types are used in building Uni-Shell Motors. Vibrometers check the smooth-running performance of each one.



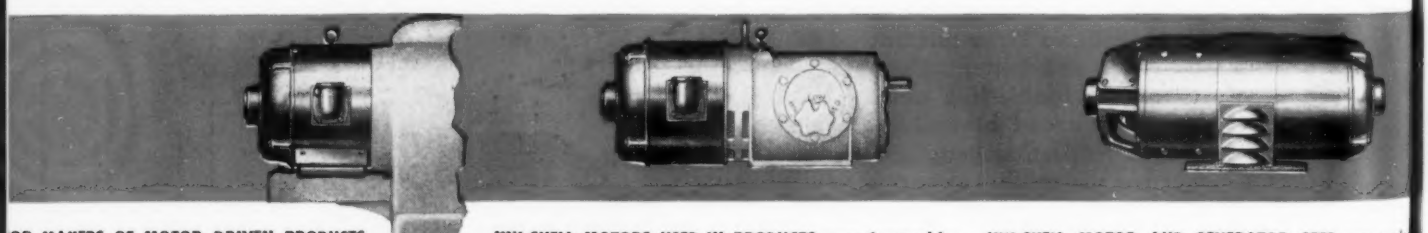
FROM SMALLEST TO LARGEST, all types of Uni-Shell Motors look alike. From an appearance standpoint, this "family resemblance" is a distinct advantage for manufacturers using different sizes and types of motors in motor-driven products and on production machines.



TOTALLY ENCLOSED, FAN-COOLED UNITS have covering shell that bolts to standard base, special ribbed end heads for maximum heat dissipation, and special fan that gives large flow of air between enclosed Uni-Shell Motor and outer cover. Cast conduit box is thoroughly gasketed.



DRIP-PROOF, SPLASH-PROOF MOTORS have covers added, or special heads. Left to right: polyphase, direct current, and repulsion induction motors with covers.



OR MAKERS OF MOTOR-DRIVEN PRODUCTS, his shows how the Uni-Shell fits against assembly. Whatever different *types* you use, no redesigning is necessary. All—in any one frame size—have *identical* shaft-head, shell, and mounting dimensions!

UNI-SHELL MOTORS USED IN PRODUCTS manufactured by Robbins & Myers. This includes hoists and cranes, Moyno pumps, and machine drives, all famous for their trouble-free performance. Buyers of these products also benefit from the Uni-Shell's interchangeability.

UNI-SHELL MOTOR AND GENERATOR SETS are made open, drip-proof, splash-proof and protected styles. T totally enclosed union ring set, cooled by a unique pri ple, illustrates streamlined compactness made possible Uni-Shell construction of both motors and generat

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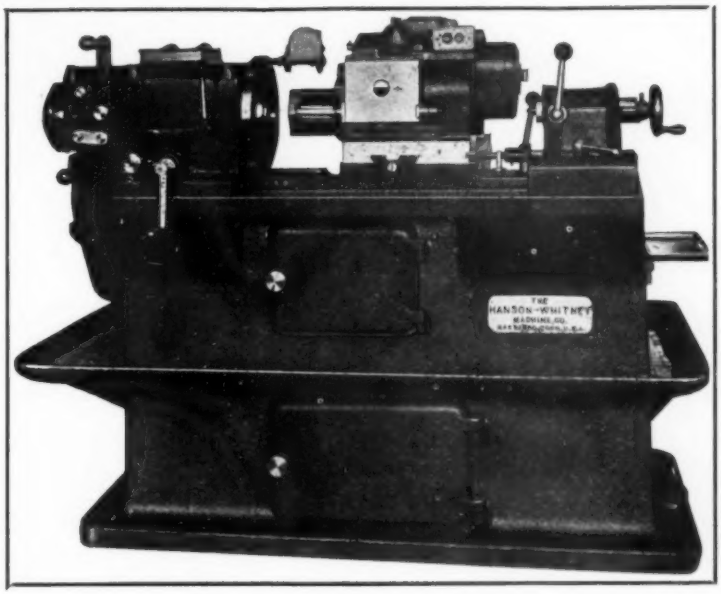

Hanson-Whitney 8" x 16" Semi-Automatic Thread Milling Machine

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ELECTRONICS bids fair to revolutionize our every day living after the war. When Brown and Minneapolis-Honeywell placed experience and manufacturing resources at the call of our government, the result of several years of research in Electronics was immediately applied to instruments—for Testing airplanes in flight—for Controlling production of high octane gasoline—for Treatment of special alloy steels for tanks, guns and armor plate—for Manufacture of synthetic rubber—and for many other purposes entering directly into the war effort.

Extending this peacetime experience to the technique of war, will bear fruit when Peace comes again, in startling new developments in the Electronic control of heat treating processes—busily engaged in peacetime production.

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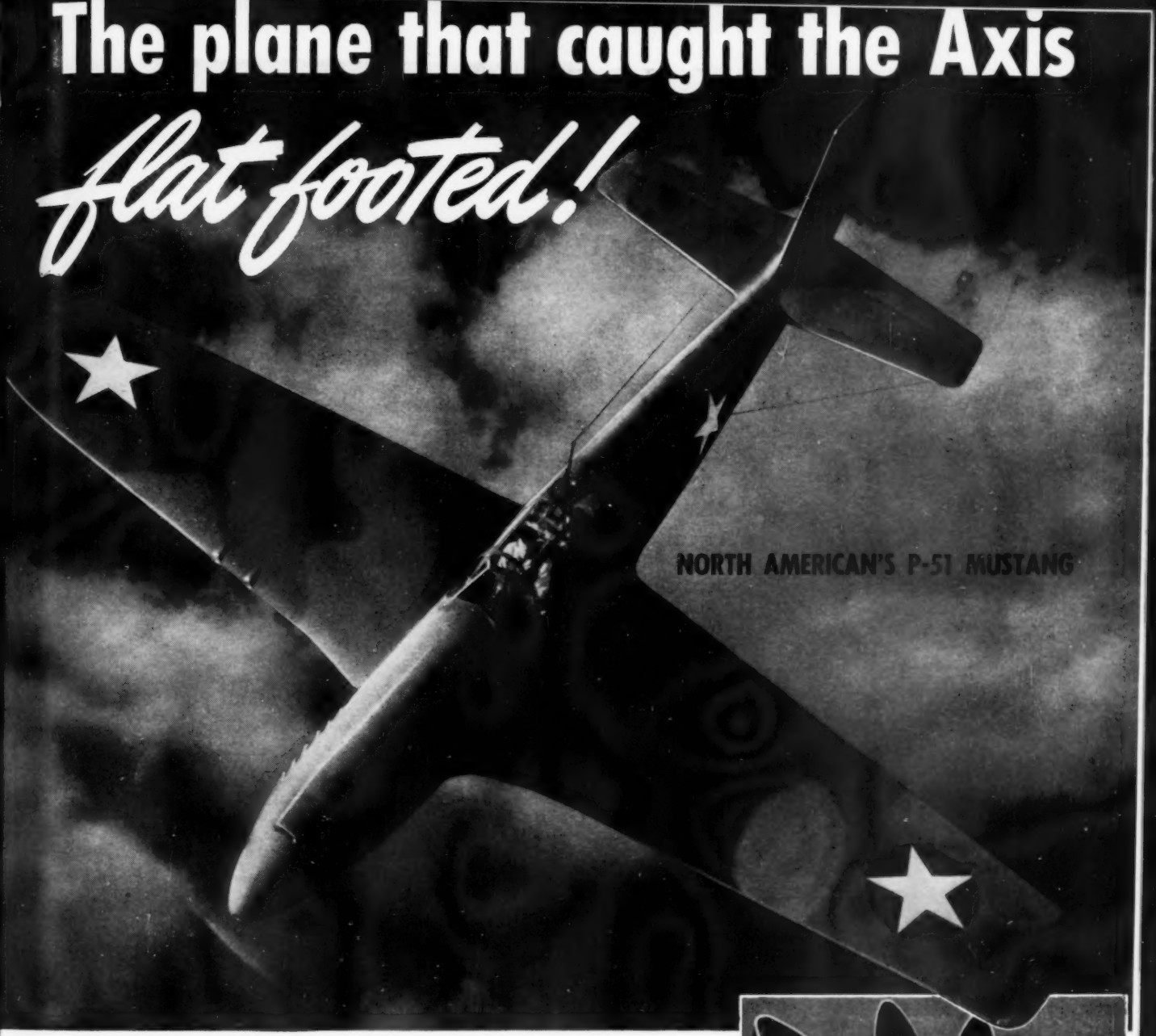
Wadsworth Road, Perivale, Middlesex, England — Nybrokajen 7, Stockholm, Sweden

The plane that caught the Axis *flat footed!*



THE Mustang is one of the finest performing fighter planes ever built for low altitudes. It has plenty of speed, is highly maneuverable and packs a healthy wallop. Even the British have lavish praise for this American plane.

The Germans had just brought out their new Focke-Wulf 190, a high altitude fighter, when the low-flying Mustang hit the scene. At low altitudes the Focke-Wulf could not match the flashing performance of the Mustang—and neither could any other German fighter.

Part of the Mustang's performance is obtained by use of SHELBY Seamless Steel Aircraft Tubing—the strongest structural form known for its weight. All excess poundage is eliminated from vital parts of fuselage and landing gear.

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Write for our new book on aircraft tubing giving complete details on types of steel, surface finishes, special shapes and many helpful tables that will save you time and effort.

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Their excellence has made them the choice of professional mechanics—has resulted in such gigantic demand that 36 separate factories operate night and day to fill war needs. Thus, Plomb tools in ever-increasing volume are available thru dependable dealers all over the country to help make weapons faster and better—and to maintain those weapons at peak efficiency.

In addition, if you need special tools for special war needs consult Plomb. And remember, for regular tools call the Plomb dealer in your neighborhood.

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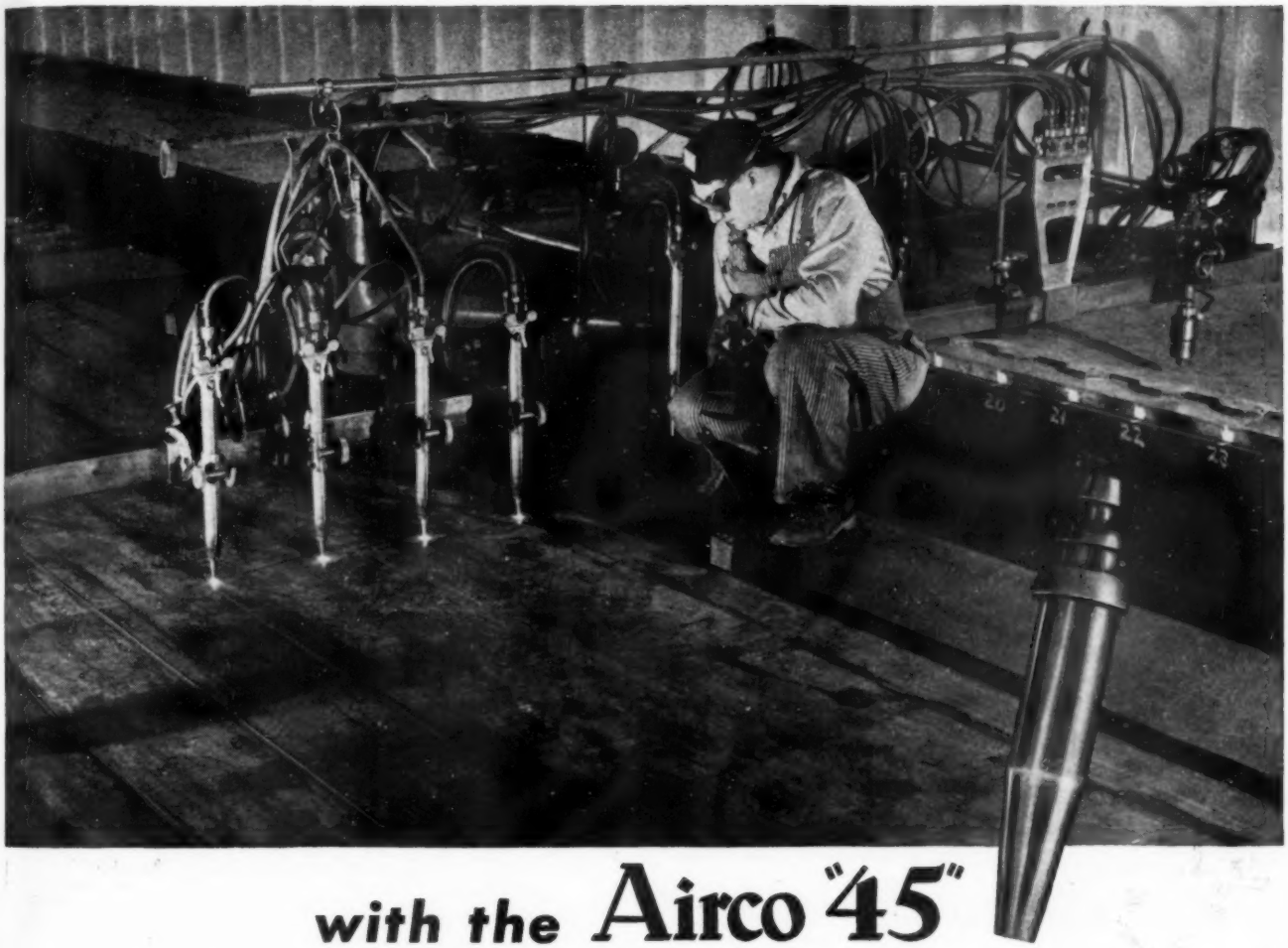

with the Airco "45"

High Speed Machine Gas Cutting Tip

You can increase metal-cutting speeds 20% to 30% with the Airco "45" High Speed machine gas cutting tip. More than a year of actual performance has convincingly proved that the Airco "45" not only cuts metal faster, but it also makes important savings in oxygen consumption.

The faster cutting speeds realized with the Airco "45" result from its divergent nozzle design and the use of higher operating pressures. This combination produces a cutting stream of oxygen that is practically free from exit turbulence. As a result the width of the cut (or kerf) is considerably narrower – the metal burned away by the oxygen is less – than when conventional machine cutting tips are used.

The Airco "45" High Speed Tip is available in sizes to cut metal thicknesses up to 8". For complete information get in touch with your nearest Air Reduction office.

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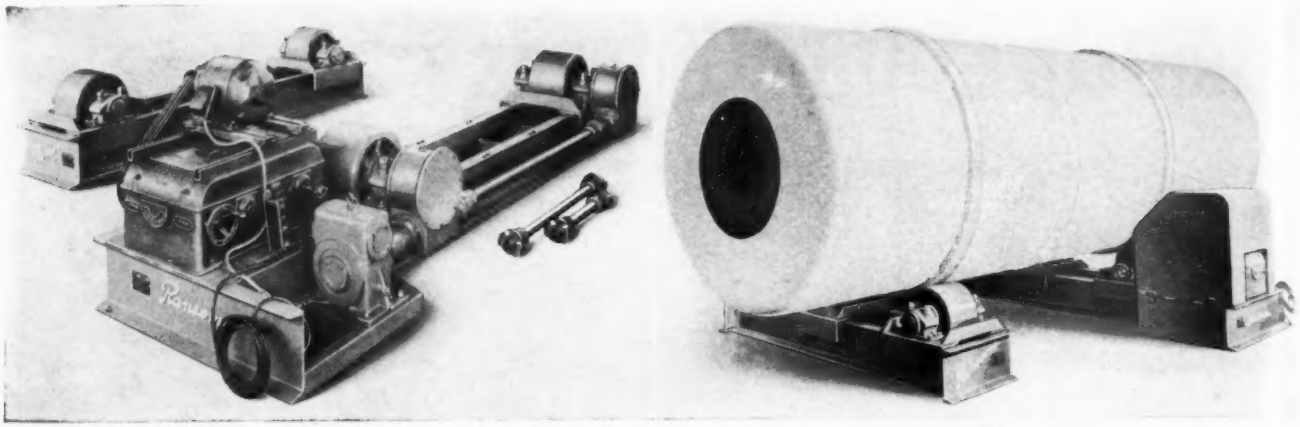


For Your Position-Welding Problem... RANSOME HAS THE ANSWER

This is the latest Ransome development in position welding equipment .... Turning rolls for rotating heavy cylindrical work.

The set of driving rolls is controlled by a variable-speed power unit. Means for adjustment to accommodate cylinders from 2-ft. to 14-ft. diameter is provided. One or more sets of idler rolls are used, according to the length of cylinder being worked.

The Ransome line of positioners and rotating fixtures includes the unit that will help you produce smoother and stronger welds .... in less time than with old methods, and at a substantial reduction in cost.

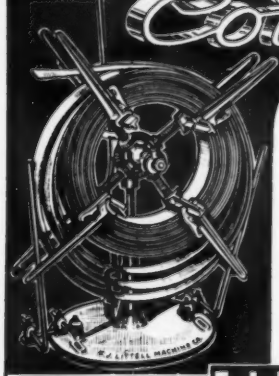
Our engineers are ready to study your problem and to offer a specific solution.

» *Literature on request*

Ransome WELDING POSITIONERS

INDUSTRIAL DIVISION • RANSOME MACHINERY COMPANY • DUNELLEN, NEW JERSEY

Coil Stock *feed it faster with* **LITTELL** AUTOMATIC CENTERING **REELS**



WAR production is rolling along faster where coil stock is unreeled with LITTELL Automatic Centering Reels. They insure a free-flowing loop of material. Coil capacities up to 20,000 lbs.

Littell also makes a complete line of other press-room equipment—Roll, Dial, Magazine and Hopper Feeds—Straightening Machines, Air Blast Valves, Pres-Vac Safety Feeders, etc.

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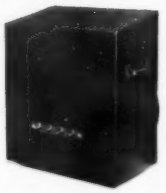

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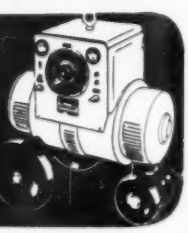

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Right here, at the lip of tool and work-piece, is where trouble usually starts.

And right here, at this crucial production point, is where a machining fluid with stamina counts most. For while there are many different machining operations, there is only one best cutting oil for your particular job. That's the one that delivers "tops" in speed, finish and tool life.

Cities Service offers cutting oils of *proved performance* . . . especially designed to meet the most exacting requirements of wartime production.

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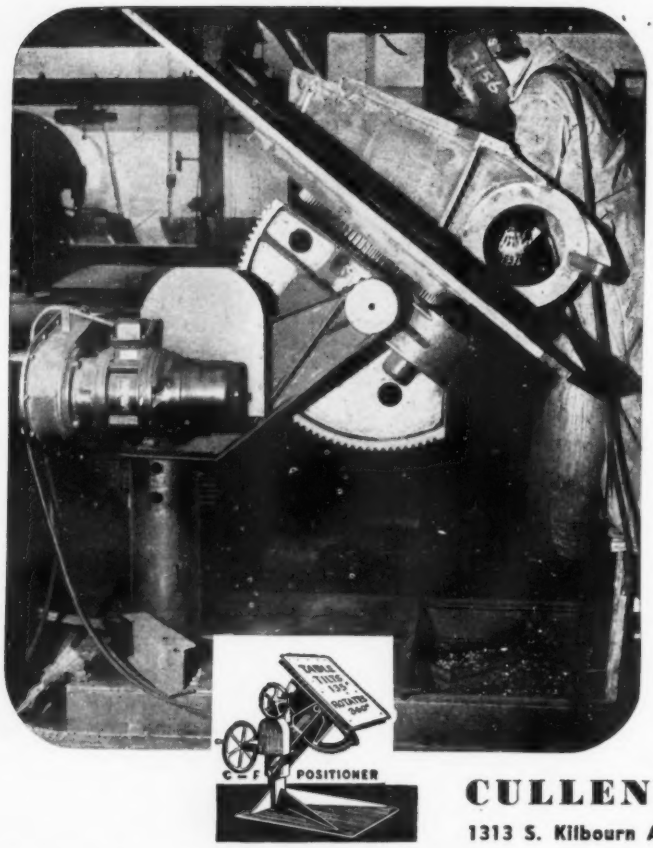

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C-F Positioners make welding a faster and more economical operation—save time, save manhours. The welder himself turns and tilts and positions even the clumsiest and heaviest weldments with a push button control—without cranes, crane crews, hoist, jacks or "flopping" space. All sides can be welded down-hand—all welds can be made faster with heavier rods; made stronger, smoother and flawless.

C-F Positioners come in sizes and types for every welding need—range from small hand operated units for light job work to giant positioners that swing great weldments weighing 30,000 lbs. All have platforms that rotate the full 360° and tilt to 135° beyond horizontal. *All are adjustable for height and are pedestal mounted to give greatest floor clearance.*

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Rectangular Heat Baths

For, liquid heat treating baths, soft metal melting, etc.

The High Speed Full Muffle Furnace attains a temperature of 2400° F., and is designed for High Carbon and Alloy Steels.

BUZZER Rectangular Heat Baths meet the increasing demands for large liquid Heat Bath Furnaces, and are built in many sizes. Also made in round type pot furnaces

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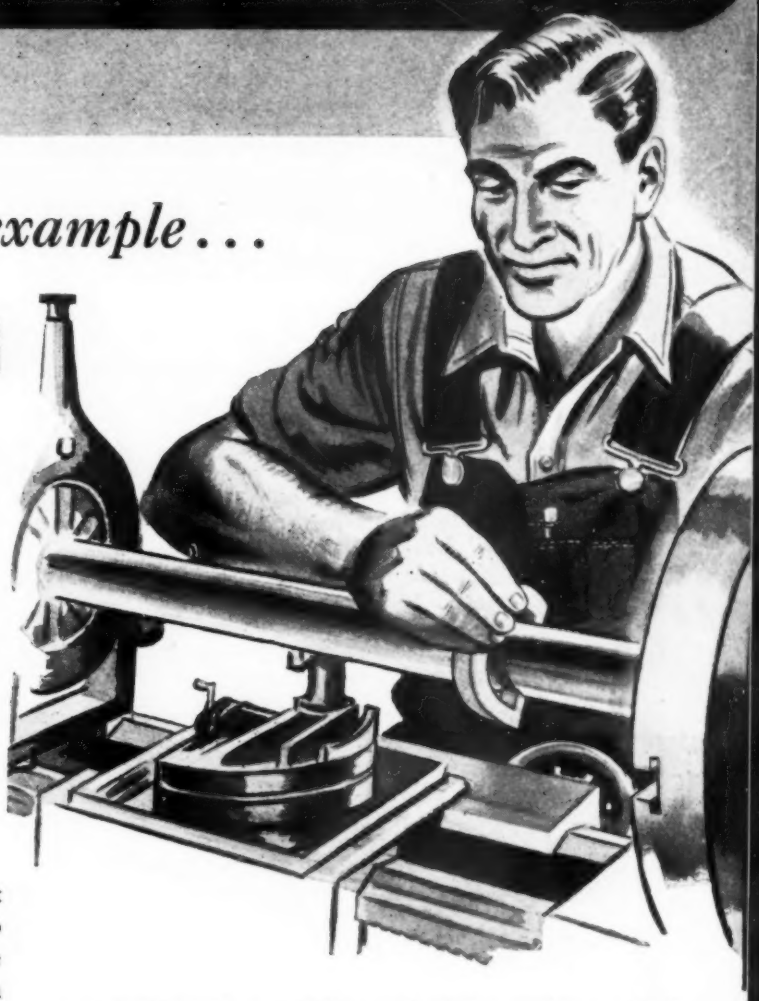
IS CHROMIUM PLATING YOUR ANSWER TO EXTENDING THE LIFE OF VALUABLE TOOLS AND EQUIPMENT?



SALVAGE for example...

CHROMIUM PLATING may reclaim many parts when worn or machined off-size

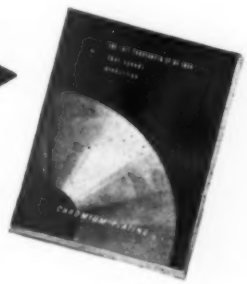
THE PROBLEM of replacing parts of worn equipment and production tools is frequently solved by building up the worn areas with chromium. Many plants also use chromium plating to reclaim parts which have been machined off-size and would otherwise have to be scrapped. Time and material saved in this way are especially important to the war effort. In addition, the reclaimed part often lasts several times longer than the original piece due to the hardness and wear resistance of the chromium plated surface.

For example, one plant salvaged several hundred cut and draw punches with off-center punch bearings by grinding them oversize and then chromium plating. Another had just completed an order for 700 spindles when the specifications were changed. Too small by several thousandths, they were salvaged by building up with chromium. Steel shafts on pumps handling corrosive liquids had to be replaced every few months . . . Reclaimed by chromium plating, they have shown no sign of wear in three years!

FOR MANY OTHER PARTS AND TOOLS

These are just a few of countless ways that chromium plating saves valuable materials and man-hours today . . . by extending the life of a wide variety of surfaces subject to wear and corrosion. Successful applications for both new equipment and salvage include:—coating and drying rollers, molding and mixing equipment, ball and roller bearing parts, cylinders, cylinder liners and piston rings, shafts, axles, pistons and many types of taps, dies, reamers, spindles, fixtures and gauges.

Booklet describes these applications in detail ➡



"The Last Thousandth of an Inch" will assist in determining the application for chromium plating on your products and equipment. In writing for your copy, please mention American Machinist.

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A Better Job

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BRIGHT ZINC PLATING
LEAD PLATING

Since cadmium is no longer available in quantity, even for the most essential operations, Cyanide Zinc Plating, Bright Zinc Plating, and Lead Plating are replacing cadmium for many operations. Successful plating is primarily dependent upon a chemically clean surface to which the electrolytic deposit can adhere. TURCO has developed two Specialized Chemical Compounds which will insure perfect surface preparation for these operations.

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Turco Penetrol is a potent liquid cleaning compound which removes all forms of soil by simple cold immersion. Removes paints and lacquers; will not attack metals; cleans by penetration and wetting out; no special equipment required.

TURCO POROKLEEN

Turco Porokleen is the perfect material for final cleaning before plating. It produces a chemically clean surface quickly and efficiently by a wetting out process which leaves no waste or film as in the case of soapy compounds. Free rinsing; cleans pores of the metal as well as surface.

Turco will gladly send complete information on approved methods for the complete processes of Cyanide Zinc Plating, Bright Zinc Plating, and Lead Plating, with directions for precleaning and final cleaning with Turco Penetrol and Turco Porokleen. Fill out the coupon below.

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6135 South Central Ave., Los Angeles

Please send free literature on Turco Materials and Methods for Cyanide Zinc Plating, Bright Zinc Plating and Lead Plating, with directions for the use of Turco Penetrol and Turco Porokleen.

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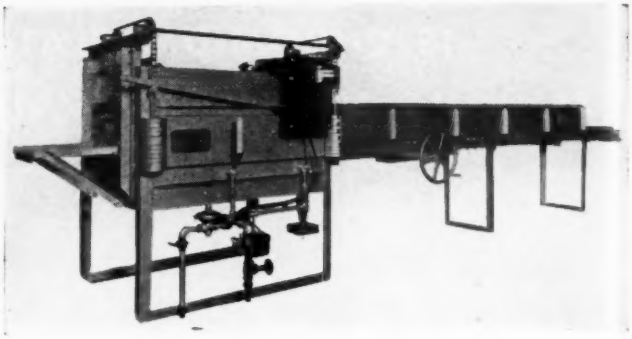

Speed-up Your Brazing, Clean Hardening or Bright Annealing Operations . . . With a

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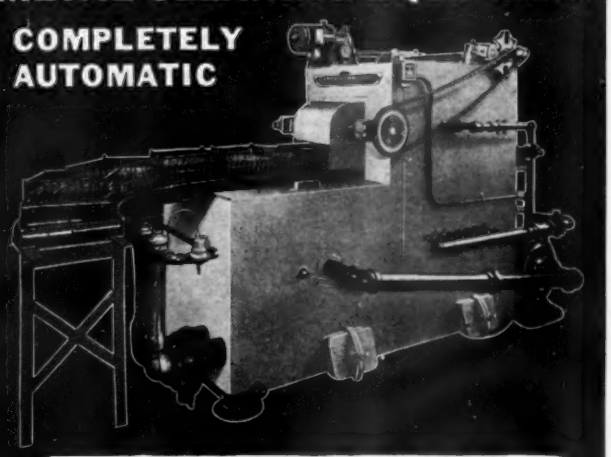
METAL CLEANING EQUIPMENT

COMPLETELY AUTOMATIC



Conveyorize your metal cleaning operations! Barry-Wehmiller Metal Cleaning Equipment will handle a wide variety of metal parts without labor for loading or unloading. Illustrated is one of a number of units cleaning 20 mm. shell.

Completely Automatic • One Push-Button Control
Spray or Submerged Types
Solvent or Alkali Type Cleaning

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Down with Down Time ... Up with Production!

A few years ago, ordinary cold drawn copper ... because of its high electrical and thermal conductivity ... was often used for resistance welding electrodes. But pure copper softens and "mushrooms" at the relatively low temperature of 390°F., resulting in poor welds and much down time for dressing.

Today, thanks to Mallory research, there are many improved electrode materials available. These special non-ferrous alloys and Elkonite* inserts produce more welds between dressings and need replacement less often. They speed resistance welding of similar and dissimilar metals ... from A to Z ... from aluminum to zinc!

Mallory 3 Metal*, for instance, is widely used for spot welding tips, seam welding rolls and flash welding dies. More than a dozen ferrous and non-ferrous metals and alloys can be joined faster, more soundly, and at lower cost, by using electrodes made of Mallory 3 Metal. These include cold-rolled steel, pickled hot-rolled steel, stainless steel, phosphor bronzes, silicon bronzes, nickel alloys, nickel silver and zinc.

Elkonite* (used as an electrode facing or insert) is recommended for projection and cross-wire welding, electroforging, electrical upsetting and electric brazing of all metals; for spot welding of pure copper, copper alloys and certain dissimilar metals; for flash and butt welding where the current density is extremely high.

Elkaloy A* is the accepted electrode material for spot, seam and flash welding aluminum and its alloys, scaly metals and most types of plated metals.

Best results in welding materials of high electrical resistance such as Nichrome, Monel Metal and stainless steel are obtained, in many cases, by tips or wheels of Mallory 100 Metal.

INFORMATION FREE! Mallory engineers can help you choose the right electrode material, the correct design and cooling, for each specific resistance welding job. Write us for detailed information. Ask for your free copy of the MALLORY RESISTANCE WELDING DATA BOOK, if you don't have one. This book is a practical manual, widely used by welding engineers in the aircraft, shipbuilding, electrical manufacturing and dozens of other essential industries! Write us today.

P. R. MALLORY & CO., Inc.
INDIANAPOLIS INDIANA
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*Reg. U. S. Pat. Off.

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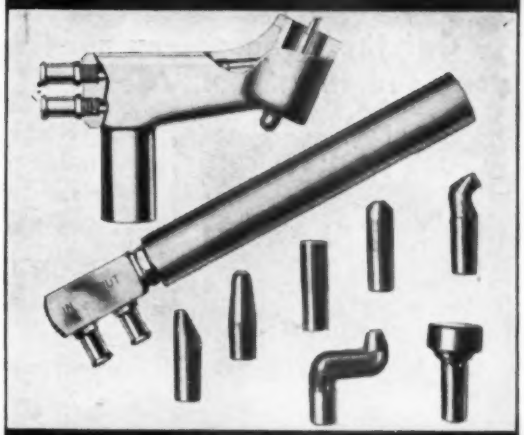
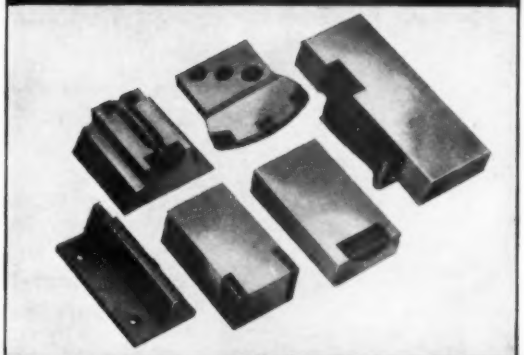
MALLORY

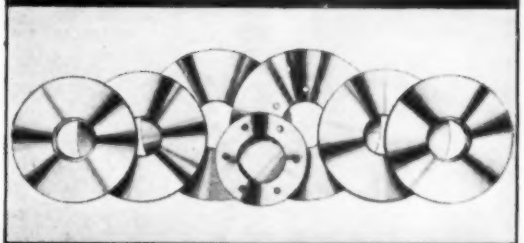
STANDARDIZED RESISTANCE WELDING ELECTRODES



SPOT WELDING TIPS AND HOLDERS



FLASH, BUTT, PROJECTION WELDING DIES



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Less Down Time
Better Welding
Lower Cost

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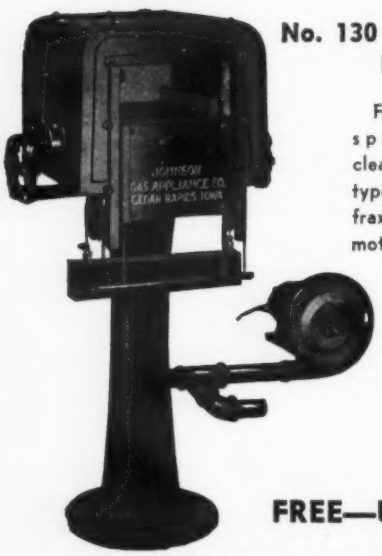
Get the furnaces you need when you need them. Call JOHNSON NOW!

No. 130A Hi-Speed Steel Heat-Treating Furnace

For quick, accurate heat-treating of hi-speed steels, use Johnson 130A. Firebox 7¾" hi, 13" wide, 16½" long. Counterbalanced door opens upward, so tools can be put in or removed without fully opening furnace door—thus preventing temperature drops. Carbofrax hearth and ¼ H. P. blower. Insulating refractory lined. 4-burner job, shown, $295. 6-burner job, $325. Complete with motor and blower. Prices F.O.B. Factory.



No. 130 Heat-Treating Furnace

For heat-treating hi-speed steels, or for clean heating of all types of steel. Carbofrax hearth and G. E. motor, with extra large Johnson blower. Heavily lined with insulating refractory. Firebox: 5½" x13"x13½". $248 F.O.B. Factory.

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This extra ordinarily adherent deposit has been proved in actual service under a wide variety of conditions. It is the answer in cases where the usual method of chrome plating has not proved entirely satisfactory.

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INDUSTRIAL CHROMIUM CORP.

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Wide experience in supplying power transmission equipment to practically every kind of industry long ago, conclusively proved that no one or two types of speed reducers could be efficiently adapted to meet all requirements. We, therefore, set about developing a line embracing all types. Thus, today, we can supply the type that is best suited to drive your equipment efficiently, economically and dependably. Philadelphia Speed Reducers are made in Worm (horizontal and vertical), Herringbone, Spur, Planetary, Spur and Bevel, and Spiral-Bevel and Herringbone Gear Types. The Philadelphia MotoReduceR (vertical and horizontal), is also available where a self-contained motor and reducer drive is desired. Philadelphia Units are made in a wide range of horsepowers and reduction ratios. Tell us your requirements and our engineers will give you unbiased recommendations.

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AND SPEED REDUCERS
LIMITORQUE VALVE CONTROLS

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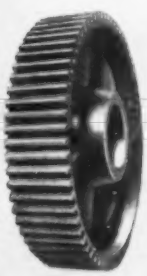
Philadelphia
LIMITORQUE CONTROL
operates all types of valves, etc., safely, economically, from convenient stations.



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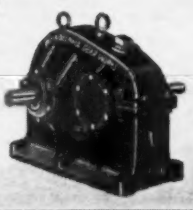
GEARS
All types and sizes of industrial gears. Can be supplied in all materials.



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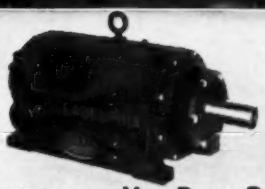
for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.



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The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.

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WORM GEAR SPEED REDUCER
right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.

BETTER DELIVERY DATES ASSURED

on gears from 2" to 52" diameter

Gears for war production requirements and to exacting specifications can now be produced by SIER-BATH with assurance of reasonably prompt delivery dates. Expanded facilities of our new, modern gear plant include the very latest types of machines for precision gear manufacture and make extra capacity available for fast production of a wide range of gear sizes.

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SIER-BATH GEAR CO.
NORTH BERGEN NEW JERSEY
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TERROR FROM THE SKIES

On many fronts our air-borne invaders are striking terror in the hearts of our enemies. For war today is three-dimensional, and mountains, deserts, seas and fortifications offer no obstacles to U. S. Paratroops.

Transporting armies through the air is a big job—a job that calls for big planes and big engines. Today, engines of 2,000 horsepower are commonplace. Already on testing blocks, in manufacturing departments and on drawing boards, in engine plants throughout the country, is the promise of engines that will dwarf even these giants.

And transmitting the power from these engines are gears of such light weight—of such extreme precision, metallurgically and dimensionally, that engineers marvel that they could be produced by mass production methods.

How the problems that were presented in their design and manufacture were overcome is a military secret. But the mounting figures of our aircraft production is proof that here at Foote Bros. these precision gears are rolling off production lines in an amazing volume.

When the war is won, these same gears give promise of revolutionary advantages in the design of machinery—advantages that will mean "better power transmission through better gears."

FOOTE BROS. GEAR AND MACHINE CORPORATION
5225 South Western Boulevard
CHICAGO

To assist Paratroops in recognizing arms, ammunition and supplies instantly, colored parachutes are used. Pictured here are men and equipment descending upon a foreign airfield.

FOOTE BROS.

Better Power Transmission Through Better Gears

Gear Specialties

SPURS • HELICALS • BEVELS
(Straight & Spiral)
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(14 to 96 D. P.)

This range logically embraces the gear components of many critical control devices essential to the war effort and this organization is proud of its contributions of such material in the program.

With full *production capacity* scheduled far into the future, all new inquiries are now necessarily subordinated to these vitally important prior commitments. However, every *urgent* need will be given careful consideration.

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Earle Bevel and Miter Gears and Pinions are made with either planed or generated teeth, of any gear material, in sizes from ½" to 13 feet in diameter. Accuracy and finish are such as to insure smooth, efficient operation and long life.
In addition to bevel gears, Earle manufactures a full range of gear types and sizes—in practically every gear material. Send for the Earle Gear booklet 42-G which contains full detailed information.
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New Features
New Advantages

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FOR SIXTY YEARS
Spur—SPEED REDUCERS—Worm
ALL TYPES OF CUT GEARS
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Facilities available for immediate production

BRAWNY GEARS

of fine pitch spur or internal gears, under 3" diameter. Fully machined blanks must be supplied by customer. Submit prints for prompt estimate.

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"HARTFORD" for Gears, Cams, Thread-Grinding

OUR SERVICE INCLUDES:

- . . . cutting gears of every description exactly to specifications
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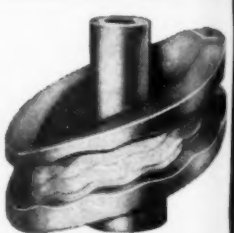
- . . . furnishing aeronautical parts on a contract basis

You plan and we execute—assuring speedy production, prompt delivery and reasonable price. Send blue prints or samples for estimate.



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The War of Gears

Equipment for the fighting forces must meet tests of impact, stress and velocity not realized in prior wars. Gears must not fail. Hence, here at Perkins, men are designing and producing gears of all types and all commercial alloys—each type and alloy for its pre-determined purposes, according to Government specifications and the inflexible rules of applied science.

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WORM GEARS SPIRAL GEARS SPUR GEARS
GROUND THREAD WORMS

Consult with our Engineering Staff!

PRECISION CUT GEARS

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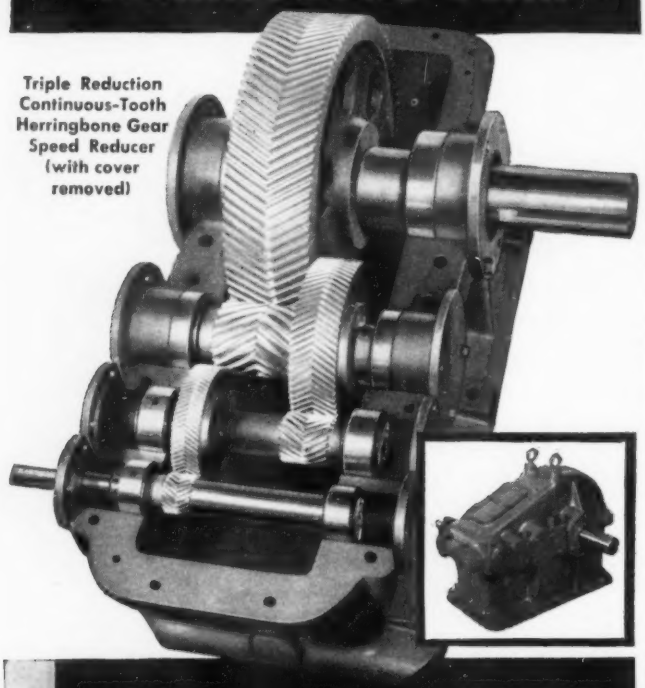
PERKINS MACHINE & GEAR COMPANY, SPRINGFIELD, MASS.

"Throw Your Scrap Into The Fight"

D. O. JAMES CONTINUOUS-TOOTH HERRINGBONE GEAR



Triple Reduction Continuous-Tooth Herringbone Gear Speed Reducer (with cover removed)

SPEED REDUCERS

MEET THE DEMANDS AND REQUIREMENTS OF INDUSTRY

Their great load carrying capacity, their very high efficiency and their continued proven performance indicates the engineering soundness of the design and manufacture of D. O. James Generated Continuous-Tooth Herringbone Reducers.

These units are the product of an organization with over a half-century of gear making experience and have a wide use in many different industries.

Catalogs are available containing complete engineering data, advantages, weights and prices.

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THE JOHNSON FRICTION CLUTCH

FLOATING PLATE CONSTRUCTION MINIMIZES DRAG, ABRASION and HEATING in the

"MAXITORQ" MULTI-DISC CLUTCH

Construction of the "MAXITORQ" is such that when in neutral, no disc touches the ones adjacent to it. A separator spring between each pair of inner discs spreads these endwise with an accordion action, so that light can be seen between all discs.

Floating plate construction is but one of several new and exclusive improvements developed by Johnson in "MAXITORQ" multiple disc design. Other features include manual assembly without the use of tools and quick and simple manual adjustment.

"MAXITORQ" CLUTCHES are ideal for machine tool and many other industrial applications. They are available in wet or dry plate single, double or cut-off coupling types in capacities from ½ to 5 hp. at 100 R.P.M. Write for detailed data sheets covering "MAXITORQ" CLUTCHES

DOUBLE

SINGLE

Write for Multi-Disc Clutch Catalog No. 43 or Consult "Sweet's" or "Thomas Reg."

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN

"When your specifications call for special gears — Spur — Bevel — Mitres — Helical — Worms and Worm Gears — Reduction Units — Why not try GRANT.

You will find GRANT service meeting all requirements on both stock and special gears."

GRANT GEAR WORKS BOSTON

CINCINNATI GEAR EXPANDS

To produce more gears
• for more equipment
• for more fronts

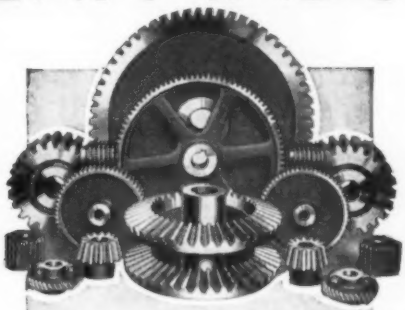
With so much depending upon the continued functioning of all mechanical equipment under severe fighting conditions on our far flung fronts it is particularly important that the varied gearing used on this mechanical equipment be the best possible.

The large number of plants, now engaged in War Work, using Cincinnati Gears gives evidence of their accuracy—adherance to close tolerances and dependability.

In order to facilitate and increase our present schedule of production we have increased our plant capacity.

We have, we believe, the most complete assembly of personnel, involving highly trained, skilled craftsmen . . . technicians . . . and engineers, plus the greatest range of precision machinery, instruments and testing devices obtainable.

Cincinnati Gear Company has gone "all out" for war production. We pledge our every effort to make more and more "Gears, Good Gears Only".



CINCINNATI
makes all kinds of gears
- SPUR
- BEVEL
- HELICAL
- SPLINE
- WORM
- SPECIAL

"GEARS Good Gears Only"

THE CINCINNATI GEAR COMPANY
MARIEMONT AVE. and WOOSTER PIKE • CINCINNATI, OHIO

"Safe-Hed" STEEL STAMPS

FOR EVERY INDUSTRIAL NEED

AVAILABLE FROM STOCK

Recommended for 90% of all Industrial stamping needs . . . Matthews "Safe-Hed"* Steel Stamps are safe and the most economical for your stamping application. *Reg. U.S. Pat. Off.

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Haskins Equipment will take your worst—and do it Longer!

★ ★ ★ It's rugged. Versatile. Capable of handling many kinds of jobs. Workmen *like* Haskins because it's easy handling. Because it turns out more work—and better work. Because it gives longer, trouble-free operation. Send for Catalog 45. Shows many ways to speed production with flexible shaft equipment. R. G. Haskins Company, 2760 W. Flournoy St., Chicago.

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HASKINS Versatile FLEXIBLE SHAFT EQUIPMENT

SPECIALISTS... not jacks of all trades!

To do one thing *perfectly* rather than many things well is the sole objective of every MEISEL gear. And being constructed with only the requirements of a specific job in mind, MEISEL gears function at maximum efficiency always. Whatever your gear problem, investigate the advantages of *specifically* engineered gear by MEISEL.

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GEARED FOR VICTORY

Bevel-Spur-Worm-Helical

THE TAYLOR MACHINE COMPANY

1917 East 61st St. Cleveland, Ohio

"TAYLOR-MADE"

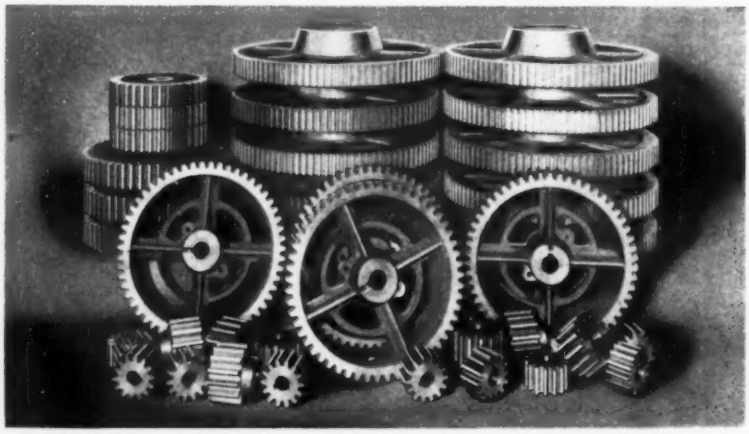
Remelt and Cast Your Lead Hammers with the Field Mould and Ladle

Save time and money—keep lead hammers in good condition at all times—easy to use—fast. Made in 7 sizes for hammers from 1 to 11 lbs. Write for details.

Also, Lead Hammers, sizes 1 to 15 lbs. always in stock.

JOHNSON TOOL CO., INC.

East Providence Rhode Island, U.S.A.



ADAMS GEARS

SPUR — HELICAL — WORMS

BEVEL — MITER — RACKS

Splined Shafts a Specialty

THE ADAMS COMPANY

Est. 1883

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This CONSERVATION PLAN

will help YOU save man-hours . . . save materials . . . speed production

Wartime Conservation means MORE than just conserving copper, steel, aluminum . . . it means the most strategic possible use of all of the ingredients of Victory—materials, manpower, time and ingenuity.

These five major points comprise a complete program developed by Westinghouse for Wartime Conservation. This program packages up Westinghouse engineering experience in the entire field of electric and power equipment and related materials. Examples noted are but five of many specific recommendations.

This experience and these recommendations are offered fully and without obligation. If you are not already familiar with them, consult your Westinghouse representative or send for the book described below. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. J-90478

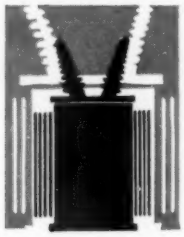
★

"WARTIME CONSERVATION," a new 100-page book issued by Westinghouse, contains complete recommendations covering the points suggested here. It will be sent you without cost, on request.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

1. Conserve by strategic selection, application and use of electrical equipment.



EXAMPLE

Various accessories will produce large increases in capacities of existing equipment, with a small use of critical materials. For instance, either air-cooling or oil-circulating equipment can increase transformer capacities up to 30%. Use of both can add as much as 60%.

2. Conserve by utilizing new developments that reduce need for critical materials and man-hours.

EXAMPLE

Hipersil*—a new electrical steel—increases the flux-carrying capacity of transformer and similar cores, large and small, up to 35%. Weight and amount of critical materials can be reduced as much as 50%.

3. Conserve by utilizing available facilities for preventing breakdowns and reducing machine outages.

EXAMPLE

"Maintenance Hints" — a complete, pocket-size manual covering recommended upkeep practice for electrical apparatus——is a maintenance help available without charge. Check your Westinghouse representative for copies.

4. Conserve by utilizing materials which in many cases can replace critical materials and do a better job.

EXAMPLE

Prestite—a new pressure-molded porcelain which can be solder-sealed to metal—is replacing bushing assemblies requiring rubber or gaskets to keep out moisture, in many types of electrical apparatus.

5. Conserve by tapping all sources of salvageable scrap.

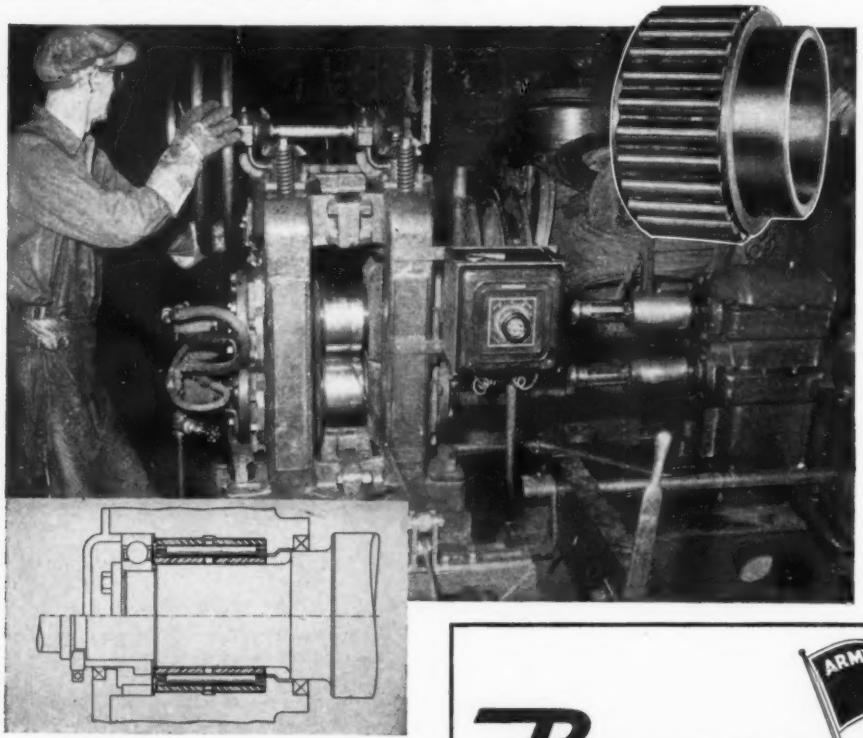
EXAMPLE

Systematic planning can uncover many ways of reclaiming worn equipment and waste material. Samples of salvage forms and organization charts in use in Westinghouse plants will gladly be made available on request.

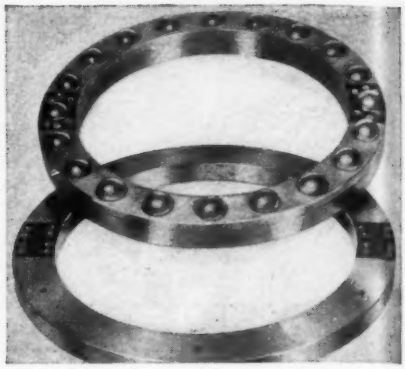
*Registered trademark, Westinghouse Electric & Mfg. Co., for HIgh PERmeability SILicon steel.

IN THE NEWS
WITH BANTAM BEARINGS

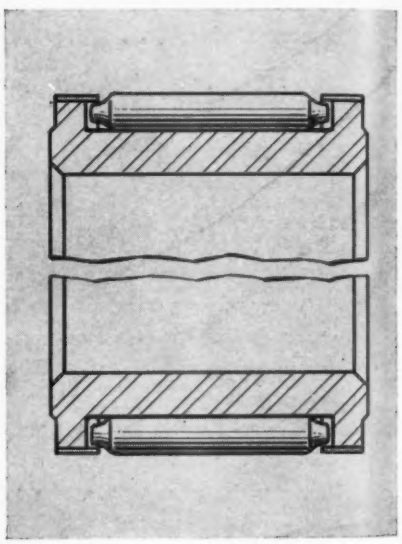
THE TARGET IS MILES ABOVE—yet these 3-inch anti-aircraft guns find their mark with deadly accuracy. The design of America's war equipment—and of the machines to produce it—presents new challenges to industry—and Bantam's skill in the design of special bearings is of great assistance in meeting these new tasks. To serve America's war needs, Bantam has built some of the largest anti-friction bearings ever constructed.



HIGH CAPACITY in a small space is provided by Bantam straight radial roller bearings in this 8-inch flattening mill built by Broden Construction Company, while Bantam Ball Bearings take the thrust load. The bearing arrangement, shown in cross-section view, permits compact design and ease of assembly.



SPLIT-RACE BEARINGS like this one, of the ball thrust type, 19½" I.D., 25" O.D., 3¾" thick, frequently facilitate the assembly of machines. This is typical of the many types of out-of-the-ordinary bearings that Bantam has produced for unusual requirements. Split-race bearings have also been designed and manufactured by Bantam in roller thrust and radial types.



MODIFIED QUILL BEARINGS are adaptable to special applications—retain the familiar advantages of the standard type. In the bearing shown, the rolls are retained to the inner race instead of the outer, as in the standard Quill Bearing. This construction is useful for cases where it is difficult to assemble the parts when the rollers are retained by the outer race.

BANTAM'S ENGINEERING EXPERIENCE covers the design and application of every major type of *standard* anti-friction bearing, as well as of a wide variety of special sizes and types. For advice on the selection of bearings that meet *your* requirements, TURN TO BANTAM.

ARMY E NAVY

BANTAM BEARINGS

STRAIGHT ROLLER · TAPERED ROLLER · NEEDLE · BALL

BANTAM BEARINGS CORPORATION · SOUTH BEND · INDIANA

SUBSIDIARY OF THE TORRINGTON COMPANY · TORRINGTON, CONN.

NEW REEVES *Reducer-Type* TRANSMISSION

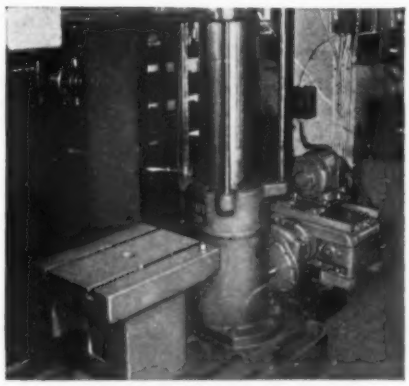
Combines Variable Speed Transmission and Gear Reducer in Single, Compact Unit . . .

● The REEVES Variable Speed Transmission, with built-in speed reducer, meets the many important requirements for accurate variable speed control and speed reduction combined in one compact, completely enclosed unit.

An outstanding advantage of this highly efficient drive is that far less mounting space is needed to obtain the lower output speeds which formerly required use of auxiliary speed reducing equipment.

Available in two enclosed designs —horizontal and vertical—for mounting in any convenient position. Each design is available in wide range of speeds and in capacities from 1 to 7½ horsepower inclusive. The Transmission in various sizes provides ratios of speed variation from 2:1 through 12:1, and the reduction gears provide ratios up to and including 6.9:1.

Either horizontal or vertical design may be equipped for individual motor drive by use of a REEVES motor base. Motor mounting is directly above Transmission, the motor base being attached to top of Transmission frame. This base is universally adjustable to accommodate any standard make of motor of correct horsepower capacities for any given size of REEVES Reducer-Type Transmission. Send for copy of Catalog A-432, giving complete engineering information.



Horizontal design unit, with motor, direct connected to radial drill press.

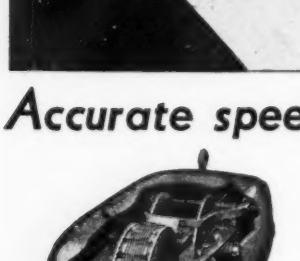
Vertical design REEVES unit is especially adapted for conditions where floor space is limited.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

REEVES *Accurate Variable* Speed Control

Curves pulled into Metal!

Accurate speed control required by new metal forming process achieved with Link-Belt P.I.V. Gear!



Get any speed instantly and maintain it accurately with this Positive Infinitely Variable speed control unit. Cutaway view shows unique chain transmission—tooth-to-tooth contact—no belts—no slip! Get Book 1874.

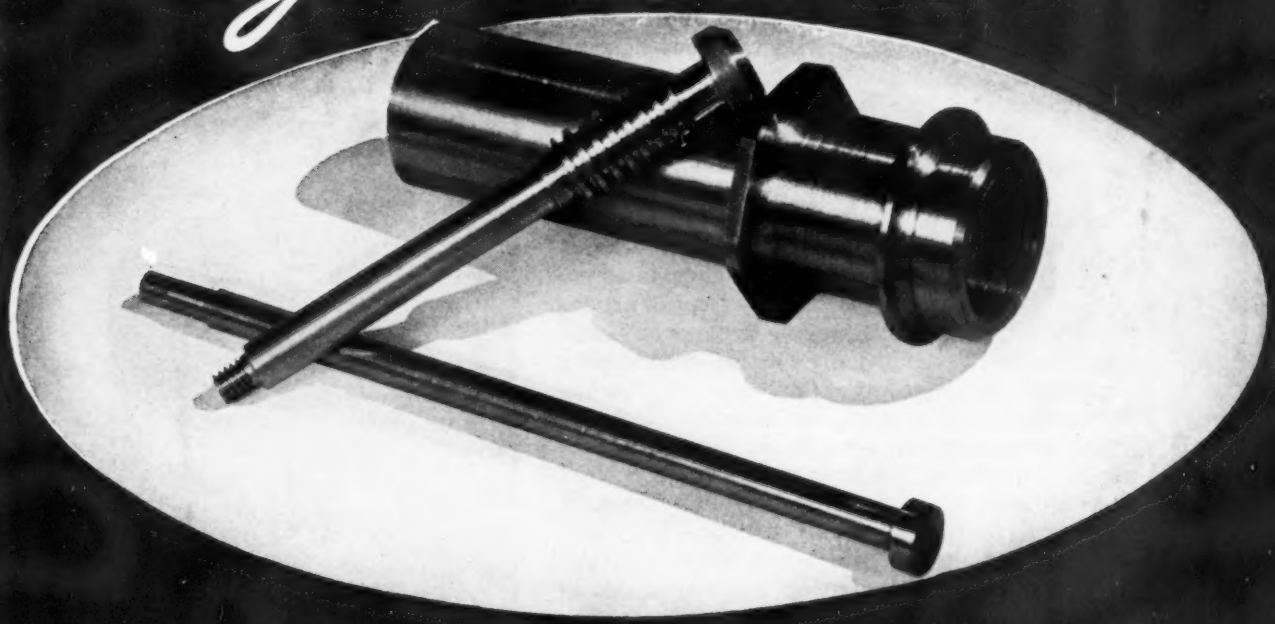
● Producing shaped aircraft skin panels faster, in larger pieces, at reduced cost, is the accompiishment that is attracting intense interest to the radically new process known as "Forming-by-Drawing." Frohman Anderson of Anderson Aircraft, Inc., New York is the inventor. A motor-driven carriage draws the sheet through adjustable forming elements, at constant or variable speed. The final shape of the panel results from the setting of the forming elements and the speed of drawing the sheet through it—thus accurate, variable speed control is a prime factor in the process. This important function is performed by a Link-Belt P.I.V. Gear variable speed transmission. Positive, tooth-to-tooth contacts permit infinite variations in speed, within the limits of the unit. Changes can be made instantly; settings maintained indefinitely without possibility of slip.

LINK-BELT COMPANY Indianapolis Chicago Philadelphia Atlanta Dallas
San Francisco Toronto Offices, Warehouses and Distributors in Principal Cities 3010

LINK-BELT P.I.V. GEAR

POSITIVE INFINITELY VARIABLE SPEED CONTROL

WILL YOUR DIE HEADS *do jobs like these?*



1⅝" Self-opening Head with Circular Hollow Mills

In the same rigid head, circular thread chasers are interchangeable with hollow milling cutters and blocks.

National Acme Engineers will gladly work with you on special or difficult hollow milling and threading operations.

NEW PRODUCTION RECORDS, for both precision and speed, are being made with Namco Circular Cutter Hollow Mills.

On a wide variety of end forming and end turning operations, these tools bring to many production plants important new advantages over single point milling tools—

1. Same "double duty" head used for both threading and end forming cuts.
2. Circular type cutters have 270° of circumference available for regrinding.
3. Cutters removed for grinding without disturbing setup, and replaced without changing precision in work.

Catalog D-42—sent on request—will bring you valuable help in saving time, increasing production, and reducing costs.

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • SCREW MACHINE PRODUCTS • THE CHRONOLOG • LIMIT SWITCHES • POSITIVE CENTRIFUGE • CONTRACT MANUFACTURING

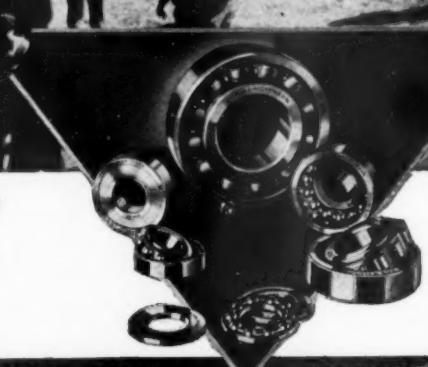
THE ARMY THAT'S FIGHTING Time

In countless mills, shipyards, factories and shops—from coast to coast—a vast army of American workers drives on, determined that our fighting forces shall be equipped and supplied IN TIME. The armament these workers employ consists of machines and machine tools—with which they are fighting against time to produce the ships, planes, tanks, guns, munitions and transport needed on the fighting fronts.

In order that production shall not lag, MACHINE BEARINGS MUST NOT FAIL. They must be adequate—in design, materials and construction. They must be well cared for—kept clean—well lubricated with the right oil or grease—periodically inspected, to detect the first sign of distress. Replacements for emergencies should be at hand.

On the production lines of America—in thousands of machines, machine tools and other vital shop equipment, ranging from tiny instruments of precision to massive mill units — NORMA-HOFFMANN PRECISION BALL AND ROLLER BEARINGS are contributing frictionless operation, accuracy, rigidity and dependability to the machine performance that is winning Victory over time.

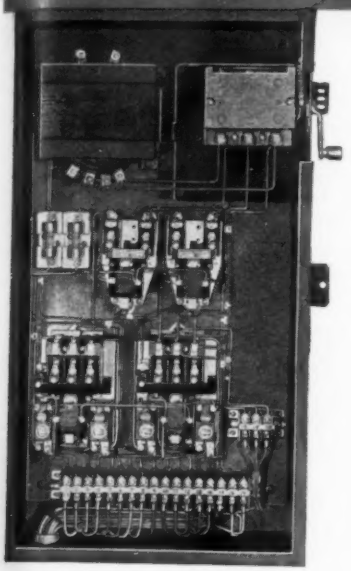
Let our engineers help you, with their 30-odd years of experience in the application, operation and maintenance of bearings.



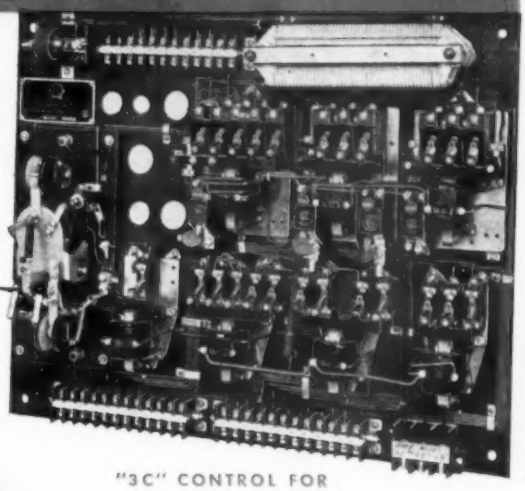
"NORMA-HOFFMANN"
PRECISION BEARINGS
BALL, ROLLER AND THRUST

NORMA-HOFFMANN BEARINGS CORP'N, STAMFORD, CONN. FOUNDED 1911

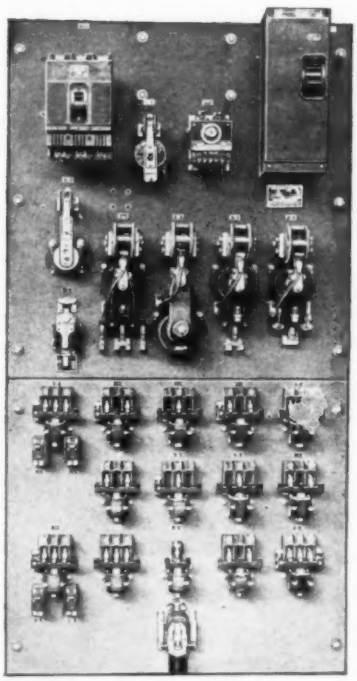
"3C" MACHINE TOOL CONTROL



SPECIAL "3C" MACHINE TOOL CONTROL PANEL



"3C" CONTROL FOR HORIZONTAL BORING MILL



SPECIAL CRANKSHAFT MACHINE CONTROL

"3C" Control Apparatus, long standard in heavy duty applications, is proving its merit in thousands of wartime machine tool operations.

Each "3C" contactor, relay, push button or other control device is designed to stand up under frequent operation in heavy duty service.

"Will it deliver production line service?" is the first question asked of our apparatus, for continuous START-STOP operations demand exceptional service and durability.

This built-in durability is demonstrating its fitness in 24 hour per day service, where electrical control, as well as motors and machines are run by several different operators.

"3C" Accessory Devices, such as Cam Limit Switches, Hatchway Limit Switches, Foot Switches, Push Buttons in countless combinations, are also helping production efforts with low maintenance operation.

"3C" Control is readily engineered to your particular needs.

STREAMLINED CABINET WITH LOUVRED TOP FOR HOUSING RESISTORS

OFFICES IN PRINCIPAL CITIES

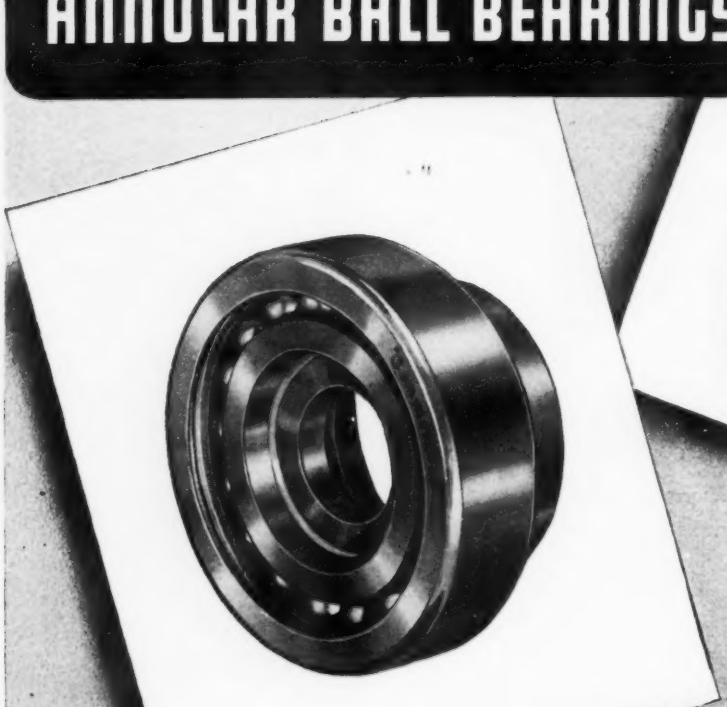
THE CLARK CONTROLLER CO.

1146 EAST 152ND ST. CLEVELAND, OHIO

QUALITY ACCURACY PRECISION

FOR THE DURATION, WE ARE UNABLE TO SUPPLY MANY TYPES OF BEARINGS FORMERLY MANUFACTURED

"Commercial" ANNULAR BALL BEARINGS



THE SCHATZ MANUFACTURING CO.
U. S. A.
REPRESENTATIVES LOCATED AT
Detroit: 2640 Book Tower • Chicago: 902 S. Wabash Ave.
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Night Raiders—

Into the black and spaceless night go America's avenging Air Raiders—dependent for their sight, sound and slugging power on precision instruments and controls made by such famed manufacturers of aircraft precision equipment as Sperry, Bendix, Kollsman, Norden and others.

Today every available Ceco Automatic Universal Precision Screw Machine is at work helping to produce, economically and at high speed, the extremely accurate precision parts for the amazing mechanical "brains" which guide our gallant sky fighters from take-off to target—and back again.

That is where Ceco Automatics come in and stay in until Victory.

AFTER VICTORY

Ceco Automatics will serve the makers of instruments, controls, appliances and devices which will bring to a post war world a new era of comfort and efficiency.

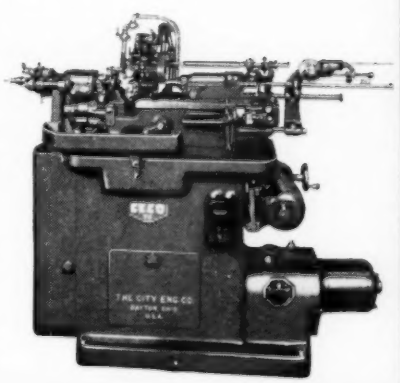
CECO'S OUTSTANDING ADVANTAGES

EXTREME ACCURACY. Ceco holds tolerances to .0003".

PROVED ECONOMY. In many cases Ceco produces a finished piece from bar stock without a second operation for finish and tolerance.

HIGH SPEED. Ceco has a Master Speed Ranger which gives from 680 to 7500 R.P.M. spindle speed by the turn of a handwheel. No changing gears, belts or pulleys. Ceco's Cam Shaft has a range of from 3 seconds to 8 minutes. No gears to change.

SIMPLICITY. Ceco's Precision Roller Bearing Spindle is always in adjustment. Operates at faster speed and runs cool at high speed. Ceco's Constant Rise feeding mechanism gives more accurate feeding.

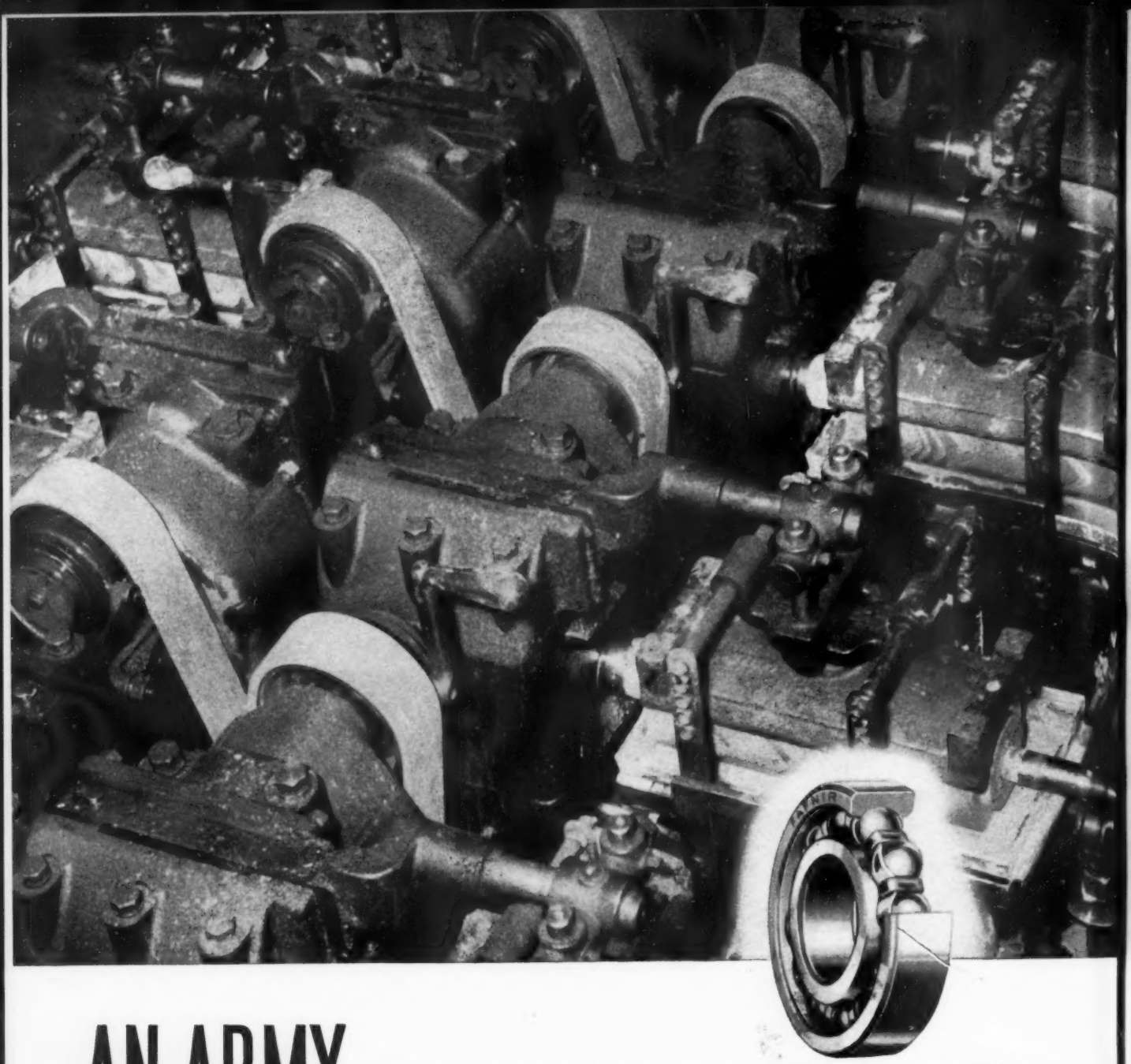


SWISS TYPE *Automatic*

UNIVERSAL PRECISION SCREW MACHINES

Engineered and Manufactured by
THE CITY ENGINEERING COMPANY
Dayton, Ohio

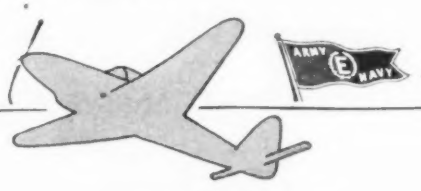
Since 1909, Designers and Builders of Tools, Dies, Fixtures and Special Purpose Machinery.



AN ARMY that marches on a Factory Floor

Imagine! . . . you surely can . . . the prodigious number of industry's "marching" machines. These machines never hear such a command as, "at ease"! They keep up the same relentless pace through one shift and the next . . . 24 hours every day. They keep our pilots in the air. They keep our tanks rolling. They keep our fighting men on the go, with blazing guns. Their steady whirring, humming, clicking, pounding is the Victory song of the nation!

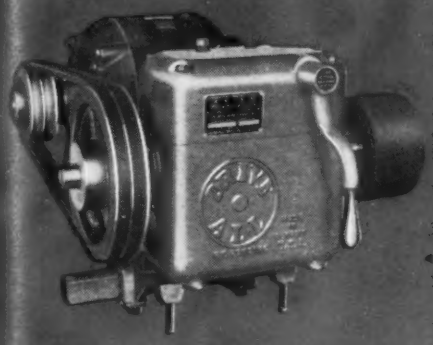
The Fafnirs working here . . . 7 of them in each gearbox, 28 more on the shafting of this 100-foot machine . . . are built to *stay on the job* under tough, abrasive conditions. Like the millions of Fafnirs serving with the fighting forces, and the millions in other industrial machines here at home . . . these Fafnirs are "taking it". Their service records can already be stamped, "far beyond the call of normal duty"! The Fafnir Bearing Company, New Britain, Connecticut.



FAFNIR

BALL BEARINGS

THE BALANCED LINE - FOR ORDNANCE, AIRCRAFT AND INDUSTRIAL MACHINERY



DRIVE-ALL
Selective Speed
TRANSMISSIONS
for

DRILL PRESSES AND RADIALS

AUTOMATICS AND TAPPERS

LATHES AND TURRET LATHES

The Proof of the Pudding is What the USER Says . . .

"All of the machines in our shop have been equipped with Drive-Alls during the last two months and we are entirely satisfied with the manner in which these machines are working. We made considerable investigation before installing your equipment and we now feel that our judgment has been vindicated."

R. M. Henderson, *Secretary*
VAPOFIER CORPORATION
2807 So. Michigan Ave., Chicago, Ill.

THESE ARE THE DRIVE-ALL ADVANTAGES THAT ARE MAKING DRIVE-ALL POPULAR IN MANY BUSY WAR-TIME PLANTS

- Fingertip Control
- Faster Speeds
- Heavier Feeds
- Positive Power
- More Production
- Better Lighting

13 DRIVE-ALL Technical Service Offices

City	*Address*	*Telephone*
Boston, Mass.	187 Dartmouth St.	Commonwealth 1190
Buffalo, N. Y.	2018 Rand Bldg.	Cleveland 2348
Cleveland, Ohio	2110 Terminal Tower Bldg.	Superior 0300
Detroit, Mich.	3400 Conner Ave.	Lenox 3400
Chicago, Ill.	30 N. LaSalle St.	Randolph 6576
Milwaukee, Wis.	743 N. Fourth St.	Broadway 2282
Racine, Wis.	837 Lake Ave.	Prospect 987
New York, N. Y.	154 Grand St.	Canal 6-1360-1
Philadelphia, Pa.	1940 Delancey St.	Pennypacker 1630
Cincinnati, Ohio	3528 Principio	East 7313
Omaha, Neb.	661 Insurance Bldg.	Walnut 4236
St. Paul, Minn.	473 N. Cleveland Ave.	Nestor 4425
Toronto, Ont.	21 King East	Waverly 1922

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Write for New Catalog

DRIVE-ALL MANUFACTURING COMPANY

3400 Conner Avenue ★ Detroit, Michigan

"ANY LANDING YOU CAN WALK AWAY FROM IS A GOOD ONE"

Official U. S. Navy photo

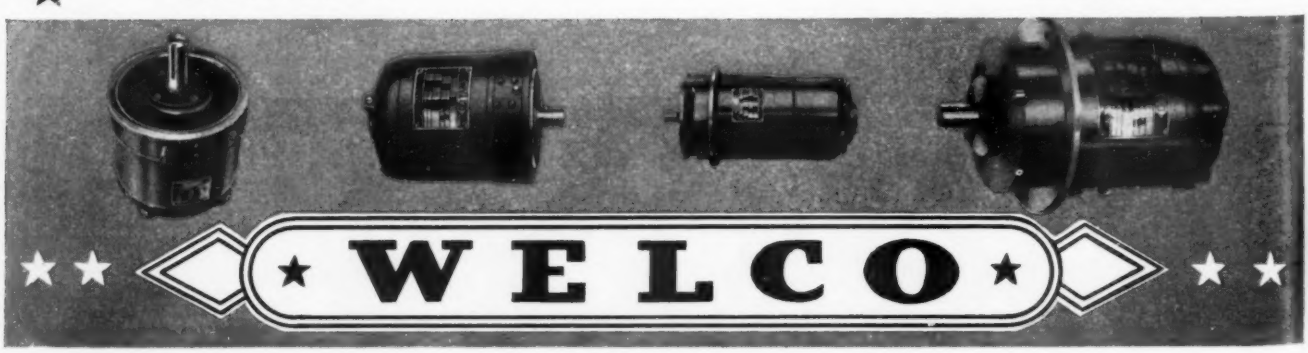
To lengthen the odds on these "postage stamp" landings, our Navy keeps the flight deck open for business by using the deck below for hangar and warm-up space.

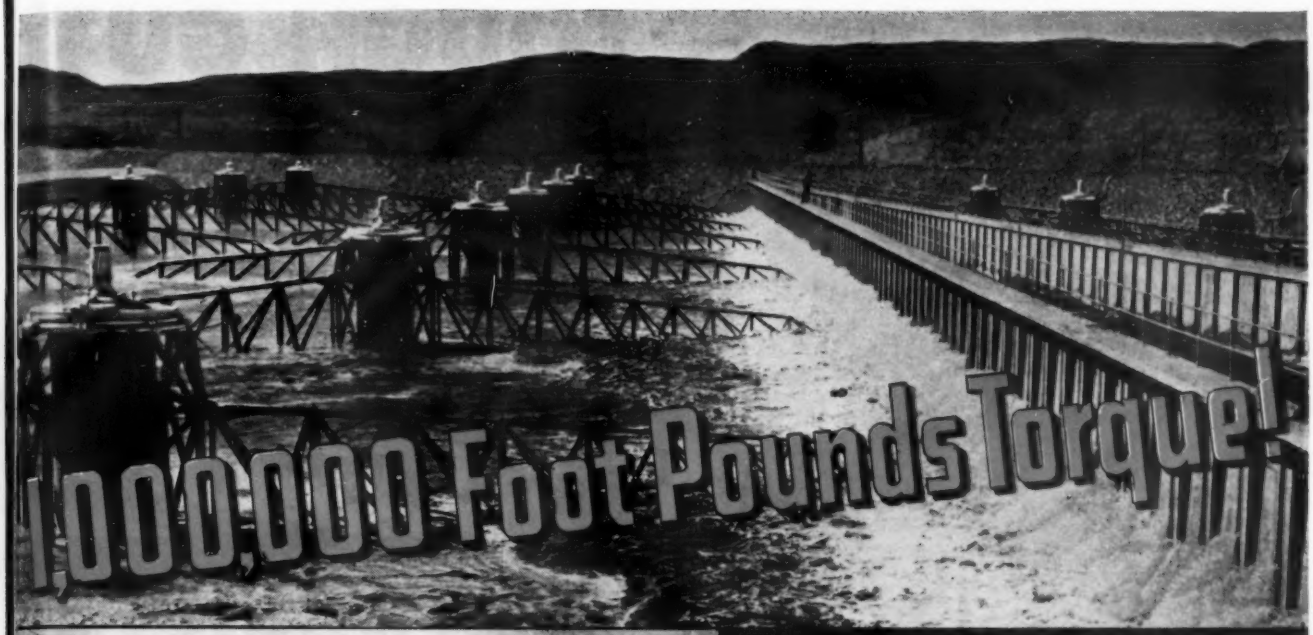
As dozens of powerful engines whine and break into a roar, the ventilation system to suck out carbonmonoxide fumes takes on life and death importance. It is small wonder the Navy is unwilling to gamble on ordinary motors for the power job on these vital fans.

The special waterproof, drip-proof Welco Motors that we build for these fans are just one more example of Welco custom motor service. Dependability in Welco Motors doesn't just happen, it's engineered.

THE B. A. WESCHE ELECTRIC CO.

1626 VINE STREET — CINCINNATI, OHIO





ORANGE
ROLLER BEARINGS
are used in

DORR TORQ THICKENERS

Dorr Torq Thickeners, developing 1,000,000 foot pounds torque, have balanced drive units fully equipped with specially designed Orange Roller Bearings. The Dorr Company, Inc., has used Orange Roller Bearings in these units continuously since 1937.

ORANGE Roller Bushings and Roller Bearings are serving in a wide range of applications, large and small—standard and special—but in every case, they provide one outstanding characteristic . . . *exceptionally trouble-free, long-life operation.*

ORANGE ROLLER BUSHINGS, for example, prove unusually helpful to engineers requiring anti-friction bearings of high load carrying capacity in small space. Roller clearances are held to a minimum, resulting in closer running clearances, which prevents rollers from running tangent to race — providing even, quiet, trouble-free service. A complete range of sizes and types is available.

Orange engineers are glad to co-operate in the application of Orange Roller Bearings to any needs. Send the coupon for Engineering Data Book showing design, specifications and types.

ORANGE ROLLER BEARING CO., INC.
ORANGE • NEW JERSEY

Mail Coupon for Engineering Data

Orange Roller Bearing Co., Inc.,
Orange, N. J.

Please send me your Roller Bushing Data Book

Name..... Title .....

Company.....

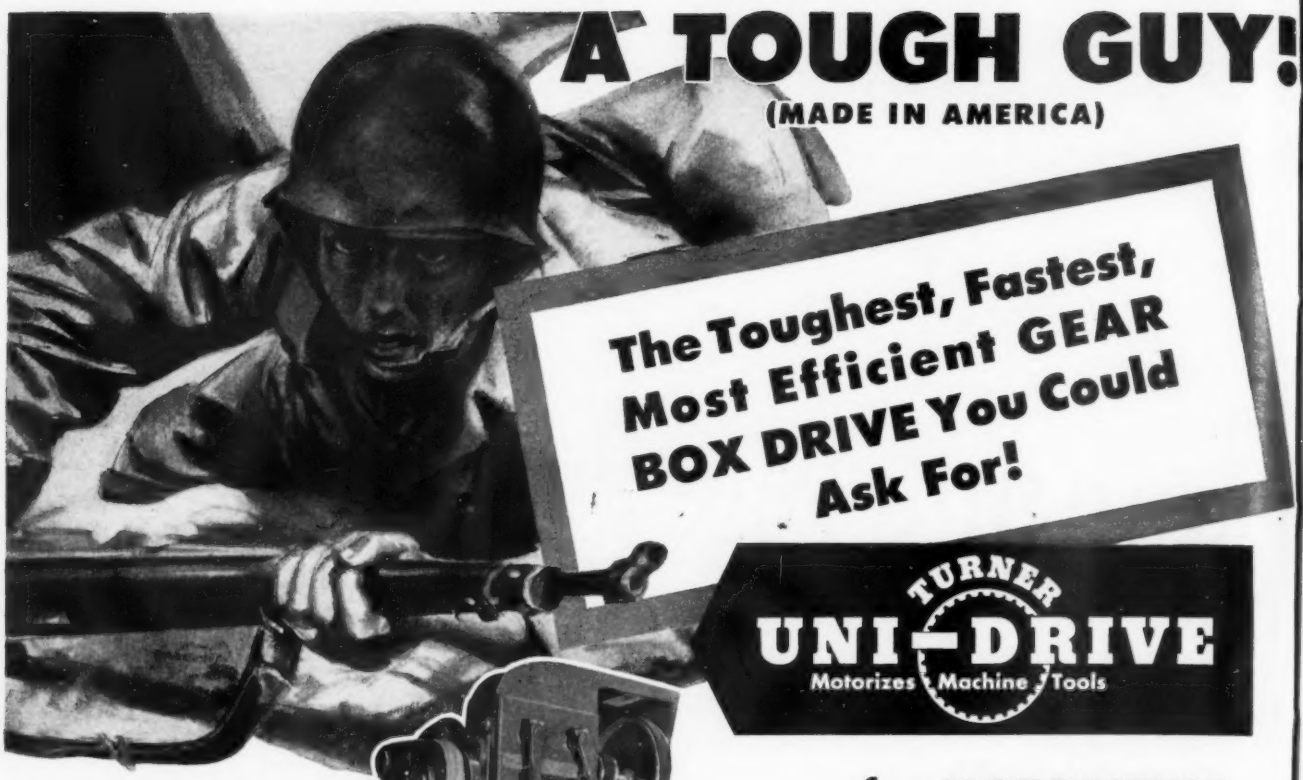
Address .....

City..... State.....

A. M. 4-15-43

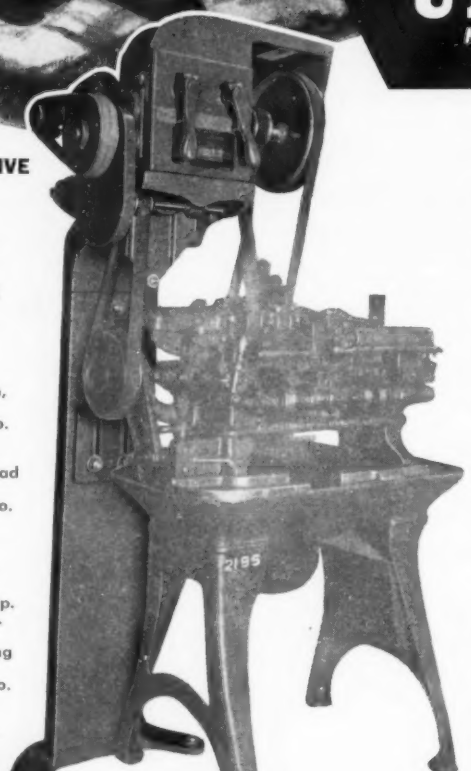
A TOUGH GUY!

(MADE IN AMERICA)



The Toughest, Fastest, Most Efficient GEAR BOX DRIVE You Could Ask For!

TURNER UNI-DRIVE
Motorizes Machine Tools



SOME USERS OF TURNER UNI-DRIVE

Aberdeen Proving Ground
American Brake Shoe & F. Co. Kellogg Division, Southern Wheel Division
Arnold Schwinn & Co.
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Automatic Sprinkler Co. of America
Bendix Aviation Corp.
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for MOTORIZING all MACHINE TOOLS

● This is no time to waste time... America and her Allies, fighting side by side all over the world for the preservation of the United Nations and freedom, have a job to do... *and fast!* Enlist the aid of Turner Uni-Drive units in your plant and you'll at once find what *a real fighting tool you have in your organization* to help you speed up production... keep down power costs... eliminate costly overhead counter shafts.

Sizes ½ to 20 Horsepower

The TURNER UNI-DRIVE can be quickly and easily installed within a few hours without completely shutting down your shop.

See your dealer today or write us for full information.

STEPS UP PRODUCTION 35% to 300%

TURNER UNI-DRIVE KEEPS 'EM TURNING FASTER

For Lathes, Milling Machines, Shapers, Turret Lathes, Radial Drills, Boring Mills, Hobbing Machines and various machine tools... also Browne & Sharpe and Cleveland Automatic Screw Machines. Can also be adapted to many special applications.

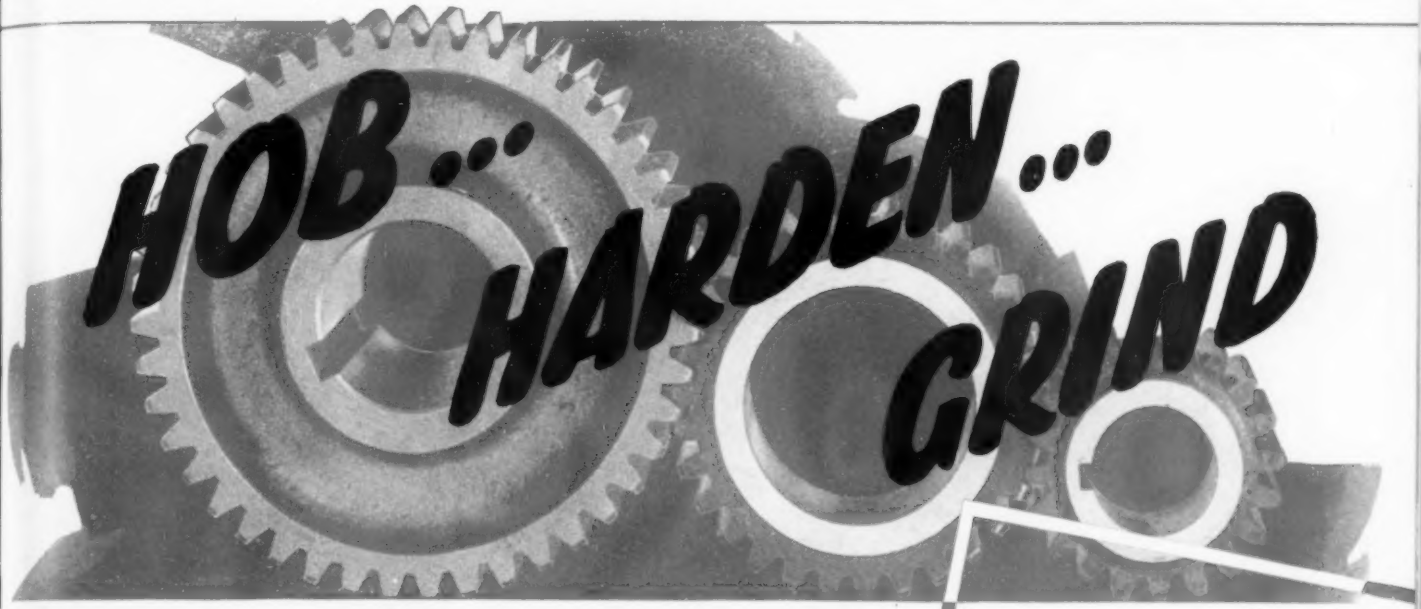
FULLY GUARANTEED—
Now successfully used in many of America's largest defense plants. Guaranteed for 1 year against defects in workmanship and materials, and sold subject to return for full credit within 60 days if not satisfactory.

NOW AT WORK FOR VICTORY ★★★

THE TURNER UNI-DRIVE COMPANY
(*Sales Division. Turner Machinery Co.*)
3416 Terrace St. Kansas City, Mo.

PRODUCING MACHINE TOOL DRIVES • ORDNANCE TOOLS • AIRCRAFT FITTINGS

FORMED WHEEL GRINDING



Gears illustrated, courtesy Twin Disc Clutch Co., Racine, Wisc.

GEARGRIND MACHINES grind internal and external gears, internal and external involute splines, straight splines, racks and serrations, the "HOB-HARDEN-GRIND" way.

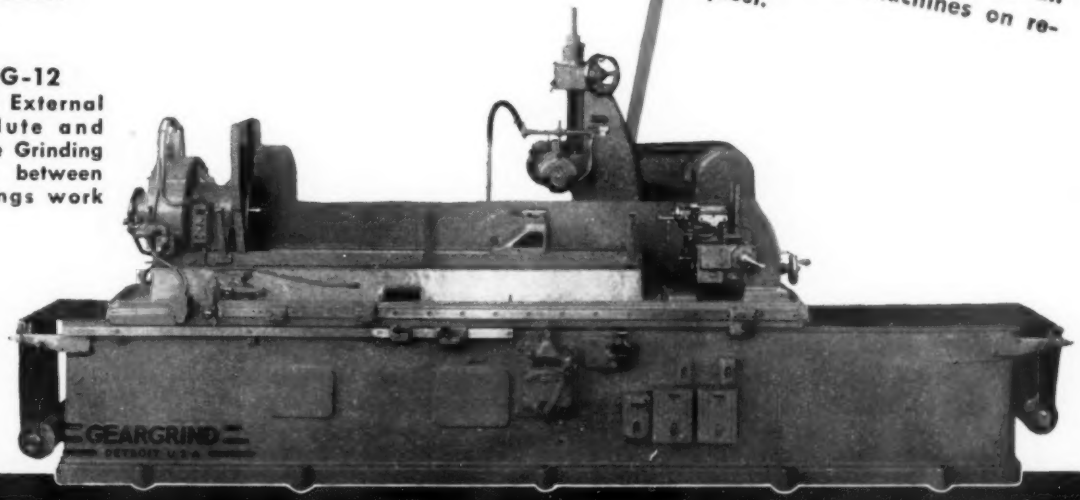
This method assures tooth profiles so accurate that the close precision tolerances of aviation and other war production are met without the customary rejects.

All over the world, GEARGRIND Machines are contributing to the growing might of the United Nations.

FOR ALL TYPES OF STEEL

The Formed Wheel HOB-HARDEN-GRIND process eliminates the worries caused by the frequently changed steel specifications caused by war time emergencies. It is particularly valuable now, when there is no assured supply of special steels, and continued uniformity is problematical. Catalog of all GEARGRIND Machines on request.

TYPE SGG-12
Combination External Gear, Involute and Straight Spline Grinding Machine. 60" between centers. Swings work 12⅞".



The GEAR GRINDING MACHINE COMPANY
DETROIT MICH. U.S.A.

Young by the count of his years, but matured by the weight of the fears he has choked in the vise of his valor, this boy—a little homesick perhaps in his lonely vigil—is the symbol of the millions who will see their first star-shell.

What is he thinking about, out there in the sullen stillness of his post? Whatever it is, you may be sure it has something to do with the life, the people, the plans he left back here. They are a mental magnet to his thoughts—revised occasionally as he ponders what he will come back to.

If the pace of production has been maintained, if enough bonds have been bought, if more than words has been devoted to post-war plans, he will come back to feel his contribution has been worthwhile.

It is up to us, here and now, to discharge our obligation to him by producing more, by investing in bonds, by planning for the pent-up, unrationed needs of that day.

If new mass-production machines are part of your post-war plans, you will want to send for a copy of "Facilities."

Designers and Builders of Intricate, Automatic Precision Machines

ARMY E NAVY

32 YEARS' EXPERIENCE

FIDELITY MACHINE COMPANY

3908-18 FRANKFORD AVENUE, PHILADELPHIA, PA.

MAHON *Weldments*

Unusual work like this massive Multiple Unit Drilling and Tapping Machine Base demonstrates Mahon welding skill.

Many New Welded Steel Plate Products Now Are Fabricated by Mahon

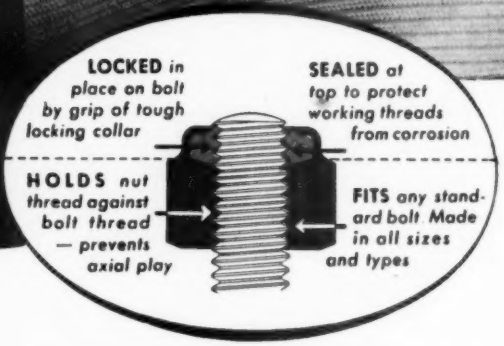
In addition to welded steel machine bases, Mahon welding skill is being utilized for the fabrication of many new and different products. Gun mounts, furnace casings, engine frames and crankcases, pump supports, electrical, gas and hydraulic equipment, comprise but a few of many items that Mahon facilities are called upon to produce. Let us look over blueprints of *your* requirements. Regardless of size or shape or purpose—if they can be practically and economically fabricated from steel plate—we will advise you. Quotations will be promptly supplied.

Fabricators of Machine Bases and Frames and Many Other Welded Steel Plate Products.

THE R. C. MAHON COMPANY

DETROIT

THESE ARE THE NUTS FOR TOUGH JOBS


LOCKED in place on bolt by grip of tough locking collar
SEALED at top to protect working threads from corrosion
HOLDS nut thread against bolt thread — prevents axial play
FITS any standard bolt. Made in all sizes and types

● War jobs have posed infinite production problems.

We know a lot of them that were solved with as simple a thing as a nut.

Because the solution was an Elastic Stop Nut.

For example, aircraft. Their very worth depends upon fastenings that grip sure and won't shake loose under the chatter of machine guns, the impact of cannon fire and the vibration of air combat.

Every plane streaming off America's production lines has Elastic Stop Nuts fastening important structural parts. Several millions of them go into aircraft every day.

And to our knowledge, not one has ever failed to do its job.

With two big plants running full-tilt 24 hours a day, we can't satisfy all the needs of today's one big customer.

But in the days ahead, with Elastic Stop Nuts generally available, peacetime products and their production are going to be better.

And our engineers schooled in solving the rigorous problems of war production will be at the service of manufacturers with fastening requirements.

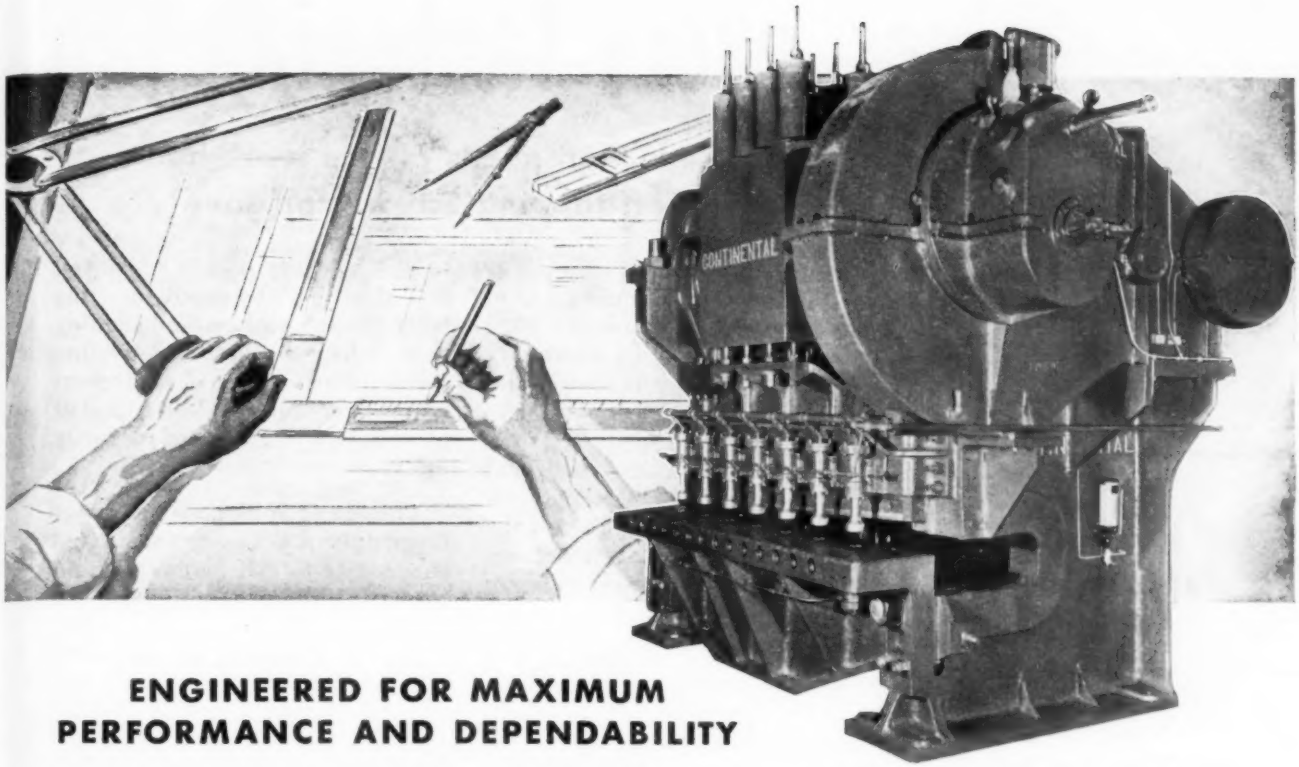
Whenever you wish, they will be ready to share their knowledge with you and recommend the desirable Elastic Stop Nut.

ELASTIC STOP NUTS

Lock fast to make things last

ELASTIC STOP NUT CORPORATION OF AMERICA
UNION, NEW JERSEY

ESNA
TRADE MARK



ENGINEERED FOR MAXIMUM PERFORMANCE AND DEPENDABILITY

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Offer many design and operating advantages that only Trabon can give you!

● Easy installation is the ***first*** advantage. A Trabon System requires a *single line* of piping only, minimizing installation time and cost.

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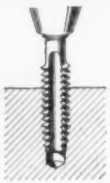
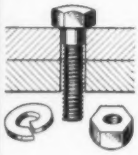
Question every fastening job

CAN YOU...



Eliminate Tapping Operations ?



Avoid Slow Bolt, Nut, and Washer Assemblies ?

Avoid Riveting and Welding in Hard-to-Reach Places ?

Eliminate Inserts in Plastics ?

Call in a P-K Assembly Engineer

to check over fastening jobs with you. He can help you search out *all* opportunities to apply P-K Self-tapping Screws. And, he'll recommend them only when they'll do the job better and faster. If you prefer, mail in assembly details for recommendations.

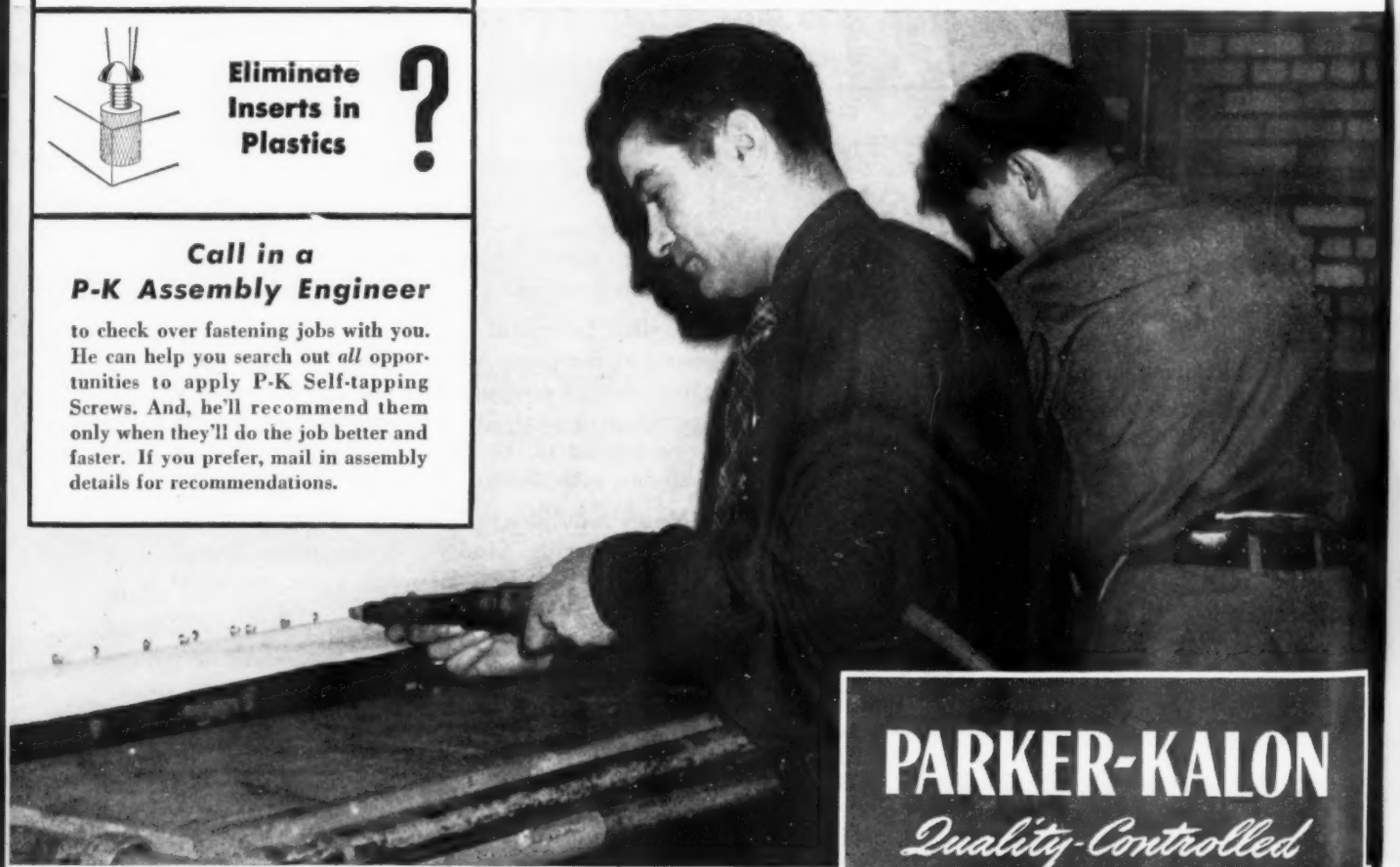
War Production needs *all* the work-hours P-K Self-tapping Screws can save

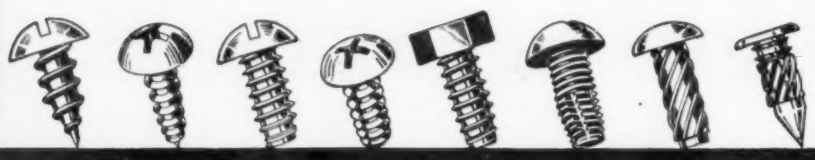
With the increasing man-power shortage, every fastening job in your plant should be suspect until you've proved beyond a doubt that it's being done by the fastest and best method possible.

Since P-K Self-tapping Screws provide greater ease, speed, and security *for a large percentage* of metal and plastic assemblies, the saving in time is of vital importance in meeting today's demand for peak production.

A Fastening Complete in One Easy Operation . . . You simply drive P-K Self-tapping Screws into plain, untapped holes. When they replace machine screws, you eliminate tapping, tap maintenance, and the problem of procuring scarce taps. When they replace bolts, you save the time consumed inserting bolts, placing washers, and running nuts. When they replace riveting and welding, expensive equipment is no longer required. When used in plastics, they end the need for costly inserts.

Change to Self-tapping Screws Overnight . . . You can make the changeover to P-K Screws with no interruption in production. No special tools or skilled help are required. Whether you are working with light or heavy steel, cast iron, aluminum, brass, or plastics . . . salvage those lost work-hours . . . question every fastening, *now!* Parker-Kalon Corp., 194-196 Varick Street, New York, N. Y.





SELF-TAPPING SCREWS FOR EVERY METAL AND PLASTIC ASSEMBLY

PARKER-KALON

Quality-Controlled

SELF-TAPPING SCREWS

Give the Green Light to War Assemblies

How this ingenious knife

HELPS THE NATION SUPPLY SUGAR

SUGAR beets are playing a mighty important part in the nation's wartime economy. To help get the maximum yield from sugar beets, Disston supplies this industry with skillfully devised beet-shredding knives—and with no less ingenious a machine for resharpening them.

It is significant that this accomplishment in fine tool-making belongs to Disston alone. It is as exclusively a Disston achievement as the top quality and craftsmanship *you* enjoy in such standard tools as Disston wood and metal cutting saws, files, hack saw blades, machine knives . . . and steel.

Moreover, Disston does not offer you fine tools alone. To help assure their effective use, Disston provides free, expert information and guidance with Conservation Control instruction cards—covering 34 different types of cutting tools.

Do your part to speed the day of Victory with the best possible use of men, time and tools in your plant. Conserve precious man-minutes. For complete information about Disston products and free instruction cards write to Henry Disston & Sons, Inc., 420 Tacony, Philadelphia, Pa., U. S. A.

Many precision operations by skilled craftsmen are necessary to produce the Disston Beet Knife . . . Among other Disston products made with equal care and skill are Solid and Inserted Tooth Milling Saws; Band Saws; Carboloy-fitted Circular Saws for non-ferrous metals; and Tool Bits.

DISSTON

ESTABLISHED 1840

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Conserve Man-minutes *and help win the war*

SELECTOR DIAL CONTROL TURRET NO. 2 LATHE

SIMPLE TO OPERATE EFFICIENT . . . ECONOMICAL

QUICK DELIVERIES

TO HIGH-RATING PRIORITY HOLDERS

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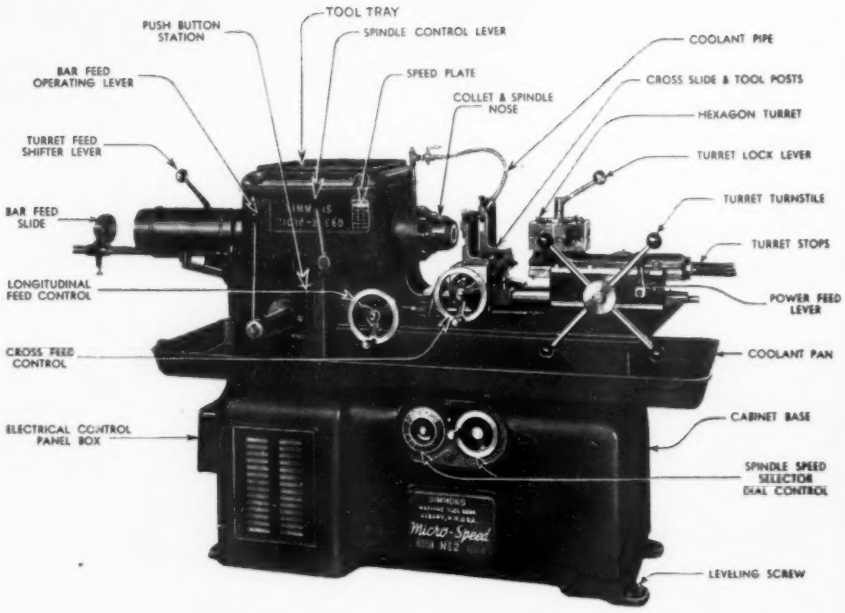
SPECIFICATIONS

Bar Capacity—1¼"; Swing over bed—14"; Swing over cross-slide—6".

Made in Plain and Back-geared types (latter shown in illustration).

Equipped with Micro-Speed Drive and Spindle Brake & Clutch.

●



RECENTLY the editor of a leading metal-working publication specializing in screw machine operation visited a plant employing several batteries of Simmons No. 2 *Micro-Speed* Turret Lathes. "We were amazed," he wrote, "at the number of diversified parts that were being turned out on these machines with very little special tooling items in use. In fact, many of the turret lathes did not have what could be termed a 'special tool' in their entire set-up."

Therefore, whether your plant has converted to war work or continues to make standard products, Simmons Turret Lathes will prove a production standby. They produce close-tolerance work speedily and economically. Following are some of the comments from satisfied users:

Cessna Aircraft Company—"We are using the Simmons Micro-Speed Turret Lathe and find it very satisfactory. In these days of full-out aircraft production, modern tooling is essential."

Swift Lubricator Company—"Stop and consider that these machines are being used to make bushings for a prominent aircraft concern. The material is x4130 steel, heat-treated to 150,000 tensile. We have turned out thousands of these parts, holding the outside diameter to .0005 tolerance, using only a stock model roll tool. These parts are reamed to a .001 tolerance and held to length within .005".

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Awarded to the employees of the Simmons Machine Tool Corporation, August 20, 1942. Service Star awarded February 13, 1943.

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Defiance Machine Works, Inc., Defiance, Ohio.

Makers of Precision Machinery **SINCE 1850**

Horizontal **BORING..MILLING..DRILLING..TAPPING** *Machines*

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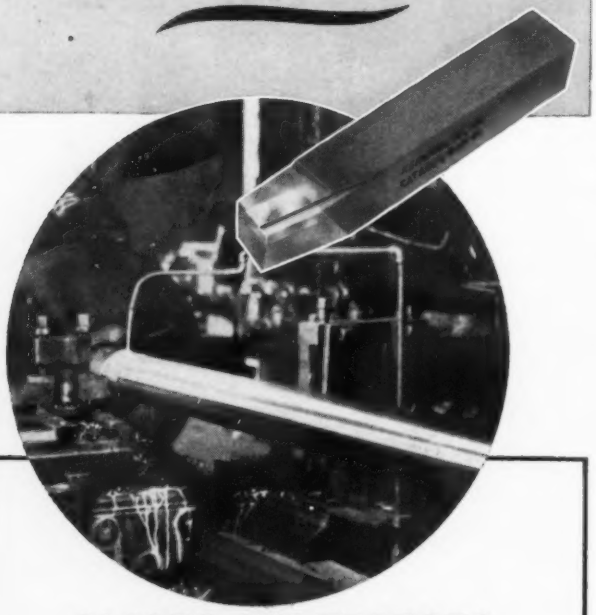
KENNAMETAL*...
THE MACHINIST'S WORD for PRECISION



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ON LONG CUTS

The rejection or reworking of finished products prevents economical production on steel machining operations. The use of ordinary carbide tools has often resulted in rejections due to excessive taper caused by tool wear.

Through the use of KENNAMETAL Tools, product rejections can be curtailed.

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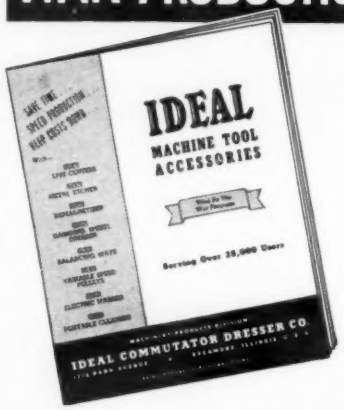
WAR PRODUCTION BOOSTERS



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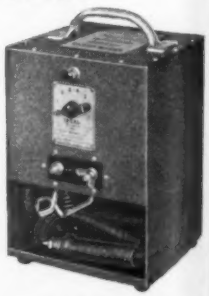

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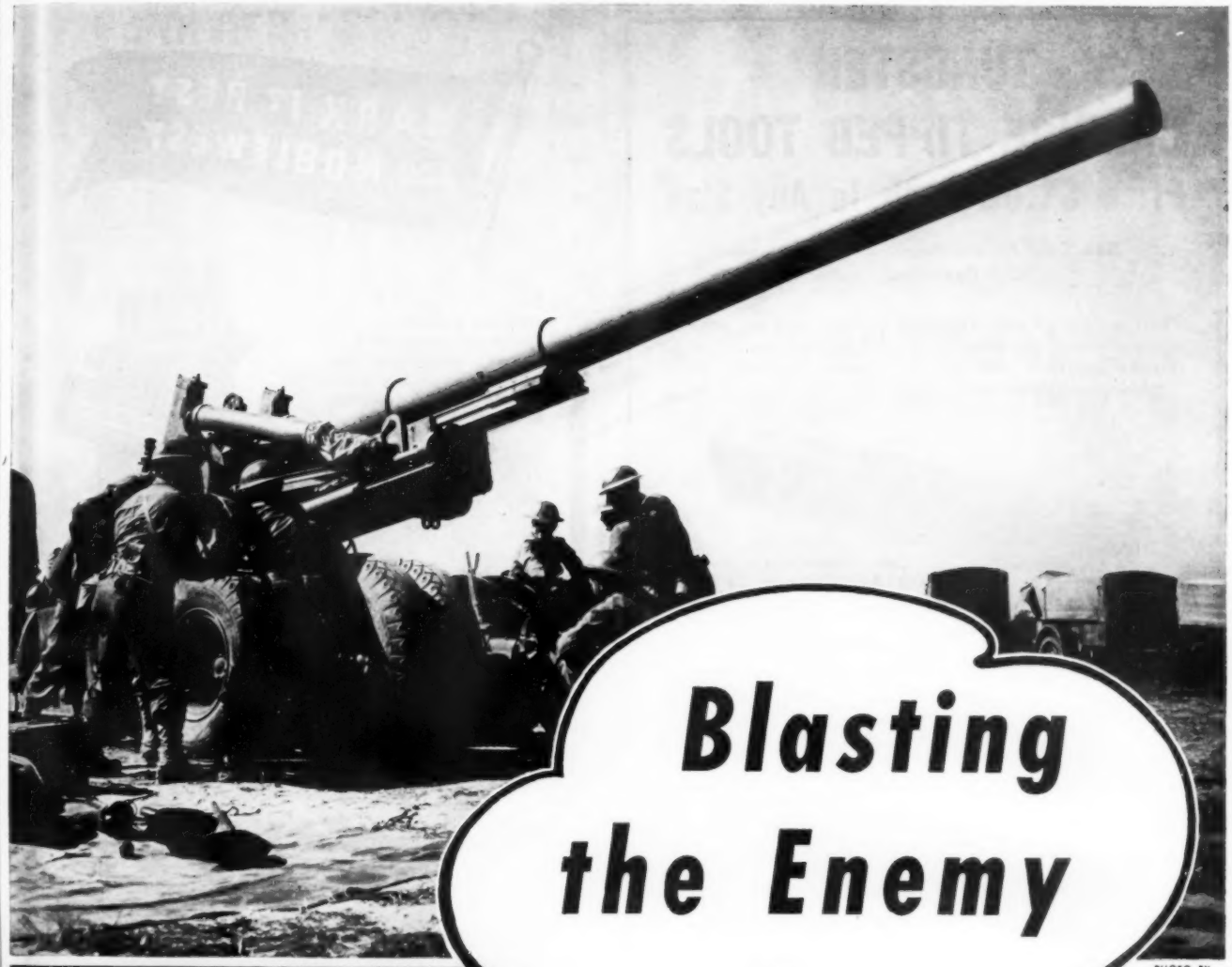
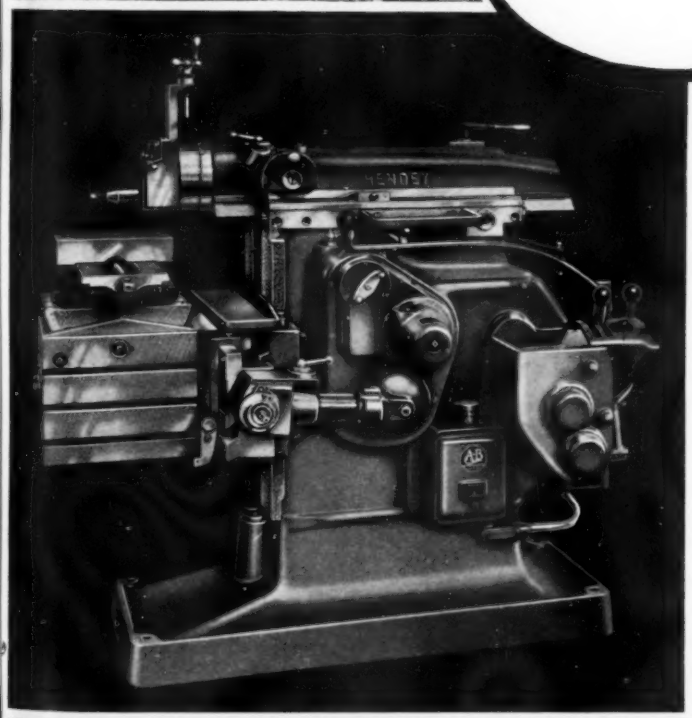


Blasting the Enemy

PHOTO BY U. S. ARMY SIGNAL CORPS



Before these 155 mm. Guns can be made there must be machine tools to do the job. Hendey 12" Crank Shapers have a definite place in the war production program, making precision parts for guns, tanks, ships and planes. 68 Years of manufacturing experience have built dependablility into these Hendey Shapers. . .

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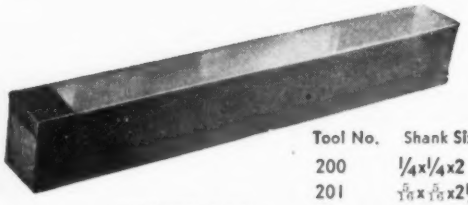
Tools are tipped with Tungsten Carbide, and are suitable for machining cast-iron, brass, bronze, aluminum, non-ferrous materials such as hard rubber, bakelite, fibre, and tough alloy steels up to 500 Brinell hardness

Left Hand-Reverse Image. Right Hand Shown

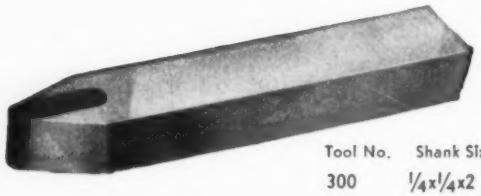
SERIES 100

Tool No. RH	LH	Shank Size
R-100	L-100	1/4x1/4x2
R-101	L-102	5/16x5/16x2 1/4
R-103	L-104	3/8x3/8x2 1/2
R-105	L-106	7/16x7/16x3
R-107	L-108	1/2x1/2x3 1/2



SERIES 200

Tool No.	Shank Size
200	1/4x1/4x2
201	5/16x5/16x2 1/4
202	3/8x3/8x2 1/2
203	7/16x7/16x3
204	1/2x1/2x3 1/2



SERIES 300

Tool No.	Shank Size
300	1/4x1/4x2
301	5/16x5/16x2 1/2
302	3/8x3/8x2 1/2
303	1/2x1/2x3 1/2

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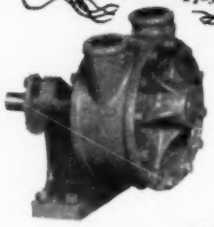

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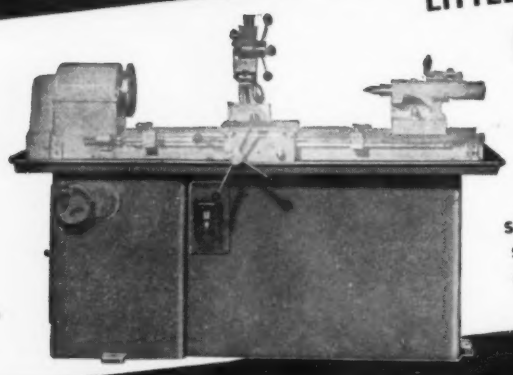

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features not to be found
in any other one machine
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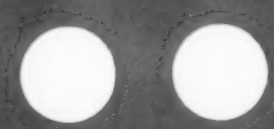

See May 13th Issue
of this publication
for further information

Sav-way INDUSTRIES
* Machine Tool Division *
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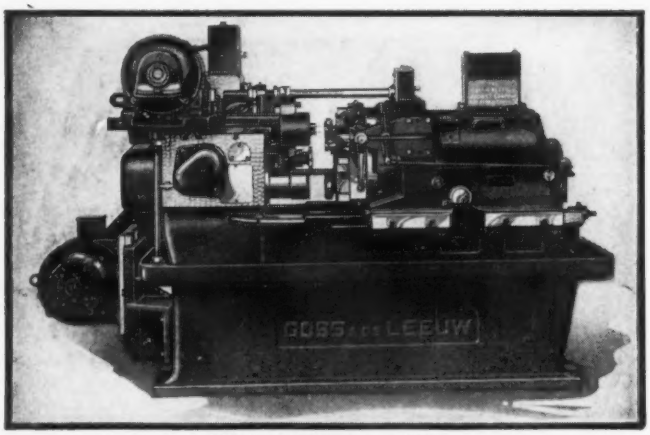
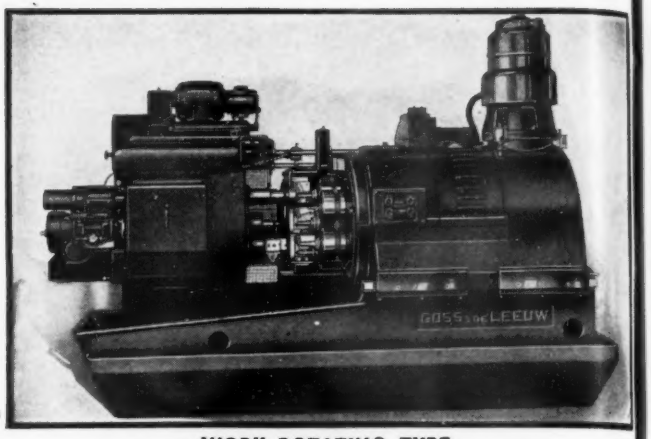
GOSS & DE LEEUW
Multiple Spindle
CHUCKING MACHINES



TOOL ROTATING TYPE

4 Spindles • 5 Chucking Positions



WORK ROTATING TYPE

5 Spindles • 6 Spindles • 8 Spindles

Both types of machines provide lead screw threading. Oversize spindles on these machines are mounted on pre-loaded anti-friction bearings. Ways are hardened; gears are of chrome-nickel steel, carefully heat-treated.

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that compensates for expansion due to heat, shock and excessive thrust loads—reducing wear to a minimum. A properly engineered live center is one of the fundamentals of setting up a job and requires a specialist's experience . . . standard shanks with Morse taper carried in stock.

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Precision Lathe

★ This quality 12 in. ball bearing tool room lathe is built for precision work and will retain its accuracy under long and hard usage. It has extra collet capacity (to 1" round), the finest precision ball or roller bearings obtainable, an improved heavy-duty, double wall apron with power cross feed; full quick change gears and full bowl headstock. Its improved Sheldon 4-speed, V-belt, lever-clutch operated, underneath motor drive is entirely enclosed in the pedestal leg and has anti-friction bearings. It is so designed that spindle belts operate thru a *standard* 1-piece bed. This bed is bridge-braced with heavy cross girts and has hand scraped ways—2 V-ways and 2 flat ways.

★ If interested in 10", 11" and 12" quality lathes be sure to see the SHELDON.

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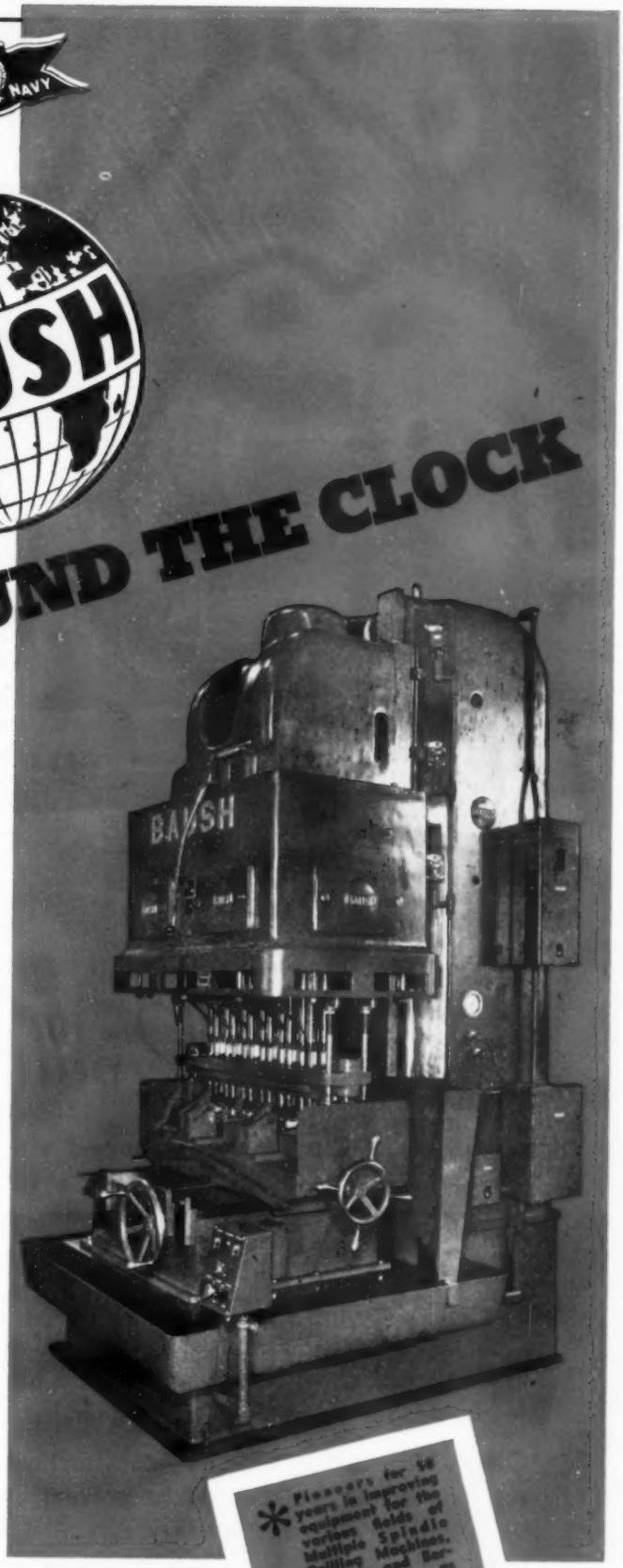
BAUSH

IS BUSY AROUND THE CLOCK



The Baush plant is busy day and night because Baush pioneering * developments in machine tool designs make the use of these machines of outstanding advantage and importance when applied to war production.

Men plus machines have made possible the honor conferred on Baush as symbolized by the Army-Navy "E" flag flying over our plant to which has been added another star on Feb. 6, 1943.

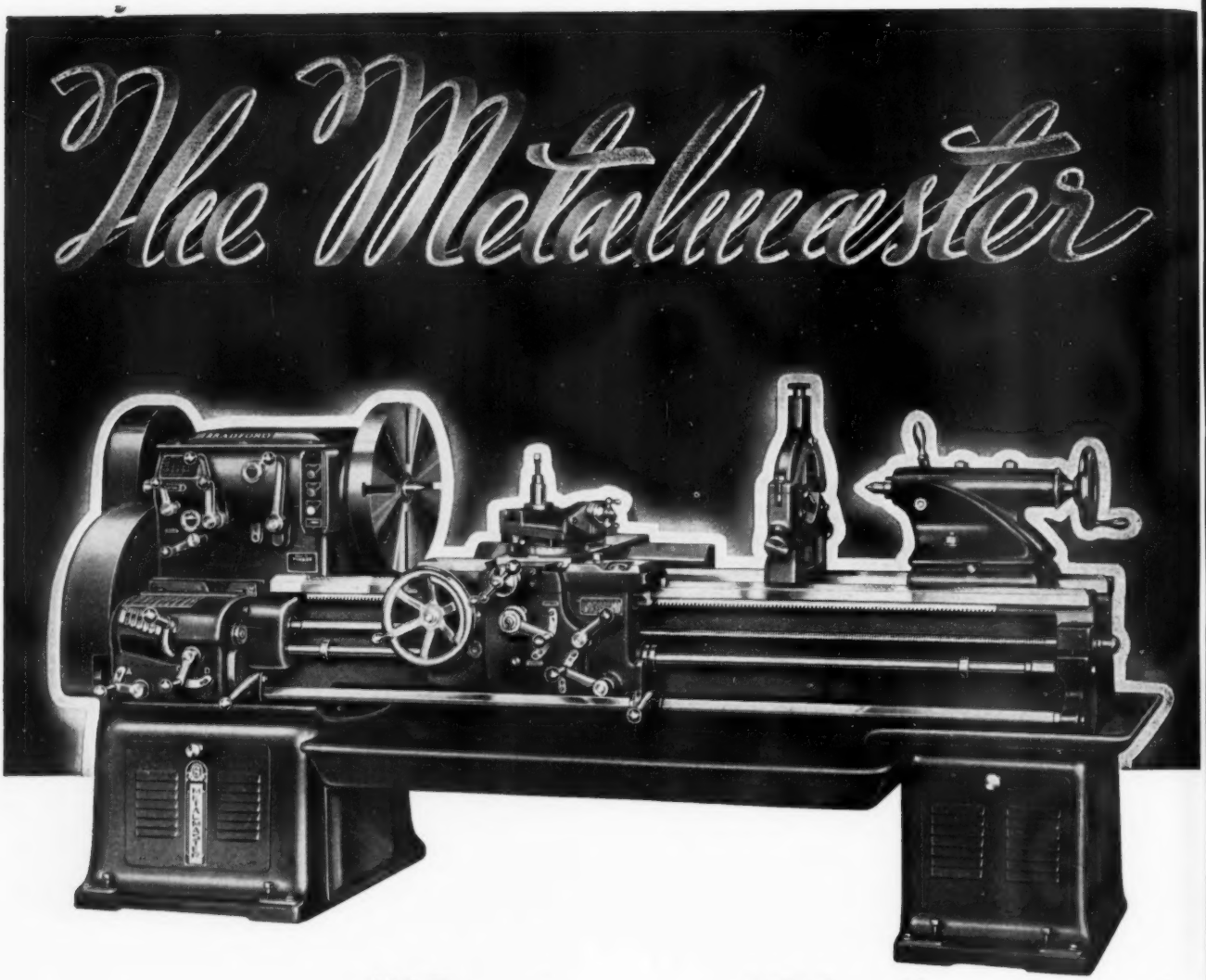
Twenty-four hours a day is the pace at Baush because the longer we work now the shorter the time to ultimate Victory and Peace.

* Pioneers for 50 years in improving equipment for the various fields of Multiple Spindle Drilling Machines, Tapping and Boring Machines, as well as special equipment.

BAUSH MACHINE TOOL CO.

Springfield, Mass. · Detroit, Mich.

The Metalmaster



. . . PRESENTS "Production Plus" FEATURES!

HEADSTOCK—heavy walls combined with sturdy center bracing—can be relied upon to deliver a steady, yet quite flow of power. Assures rigidity under heavy cuts.

GEARS—machined from heat-treated alloy steel — carefully shaved and lapped to avoid distortion.

QUICK-CHANGE FEED BOX—offers sixty-four changes ranging from fine to coarse—makes possible screw cutting and feeds without the removal of a gear.

CARRIAGE AND APRON—construction and connection to rod and screw are such as to prevent unevenness of motion or springing, even under heavy cuts.

Choose Metalmaster: from headstock to tailstock, a product of highly skilled engineering design—the ultimate in a speedy metal turning unit. METALMASTER Lathes; 12", 14" and 16" sizes.

Write today for complete catalog—fully explains the METALMASTER.

The BRADFORD MACHINE TOOL Co

MANUFACTURERS OF METAL WORKING LATHES; CAM FEED DRILLING AND TAPPING EQUIPMENT, HYDRAULIC DRILLING MACHINES . . . IN BUSINESS SINCE 1840

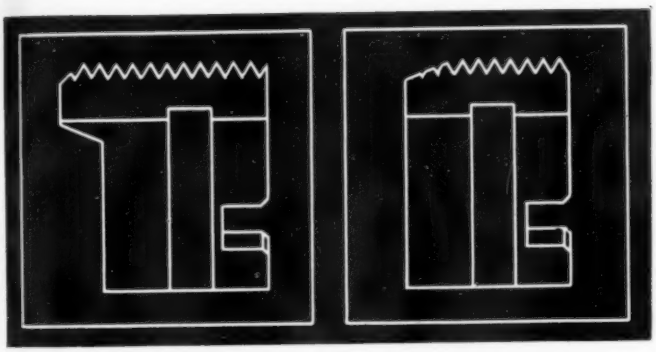
659 EVANS AVE. . . . CINCINNATI, OHIO

GEOMETRIC

Pointers

FOR SAVING HIGH SPEED STEEL

No. 4 "TELL ALL" When You Order Chasers



The chaser on the left is a projection chaser—one for use on shoulder threading, especially where the shoulder has a large diameter. The chaser on the right is a regular chaser with a standard 22° chamfer designed for straightaway threading. Regular chasers with this chamfer require less power, will cut a better thread and require less precious high speed steel.

When you order Geometric Chasers you have in mind a definite job which you wish them to do. We can help you do that job better if you "tell all" when you order.

Give us the exact specifications of the material to be threaded —not just steel or brass, but what kind of steel (S.A.E. Specifications) or brass, and whether it is a forging, stamping, etc. Tell us the tolerances called for, the machine on which the job is to be done, whether it is straight-away threading or to a shoulder. Tell us the hardness of the material, if it's heat treated. Enclose a detailed sketch of the part if possible.

By giving us all the information you possess you can help us to supply you with chasers designed for maximum efficiency on **your** job, correctly heat treated, with the proper hook, proper clearance and chamfer to give long, accurate service. The Geometric Tool Co., New Haven, Conn.

ANOTHER GOOD *Pointer*

The Geometric Tool Company is listed on the Treasury Department's Roll of Honor of those companies which contribute at least 10% of their gross payroll for War Bonds. Buy War Bonds and Stamps each payday! Insure Victory for America now, and financial security for yourself in the future!

GEOMETRIC

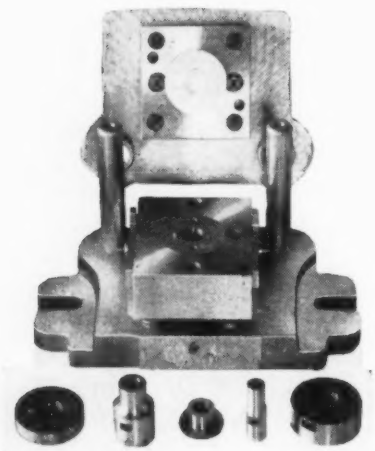
SELF-OPENING DIE HEADS
COLLAPSING TAPS
CHASER GRINDING MACHINES

SOLID ADJUSTABLE DIE HEADS
SOLID ADJUSTABLE TAPS
THREADING MACHINES

AMERICA'S LEADING

Radio, Electrical and Aircraft Manufacturers are making washers...

"THE HOVIS WAY"



MADE IN FOUR SIZES:
¾" . . 1½" . . 2½" . . 4"

Are you using this advanced method? Consider these facts:

1. HOVIS Dies, featuring interchangeable parts, make literally thousands of different washers, thus eliminating special washer dies.
2. HOVIS Dies save the expense of ordering washers independently and keeping large inventories on hand.
3. HOVIS Dies give you the facilities to make washers on short order, as you need them . . . no costly delays are necessary.
4. HOVIS Dies save the materials that would normally be used to make dies for each separate washer.
5. HOVIS Dies save labor costs by eliminating the work of making new dies for new washers.

SEND THIS COUPON TODAY

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SCREWLOCK CO
8098 E. Nine Mile Road
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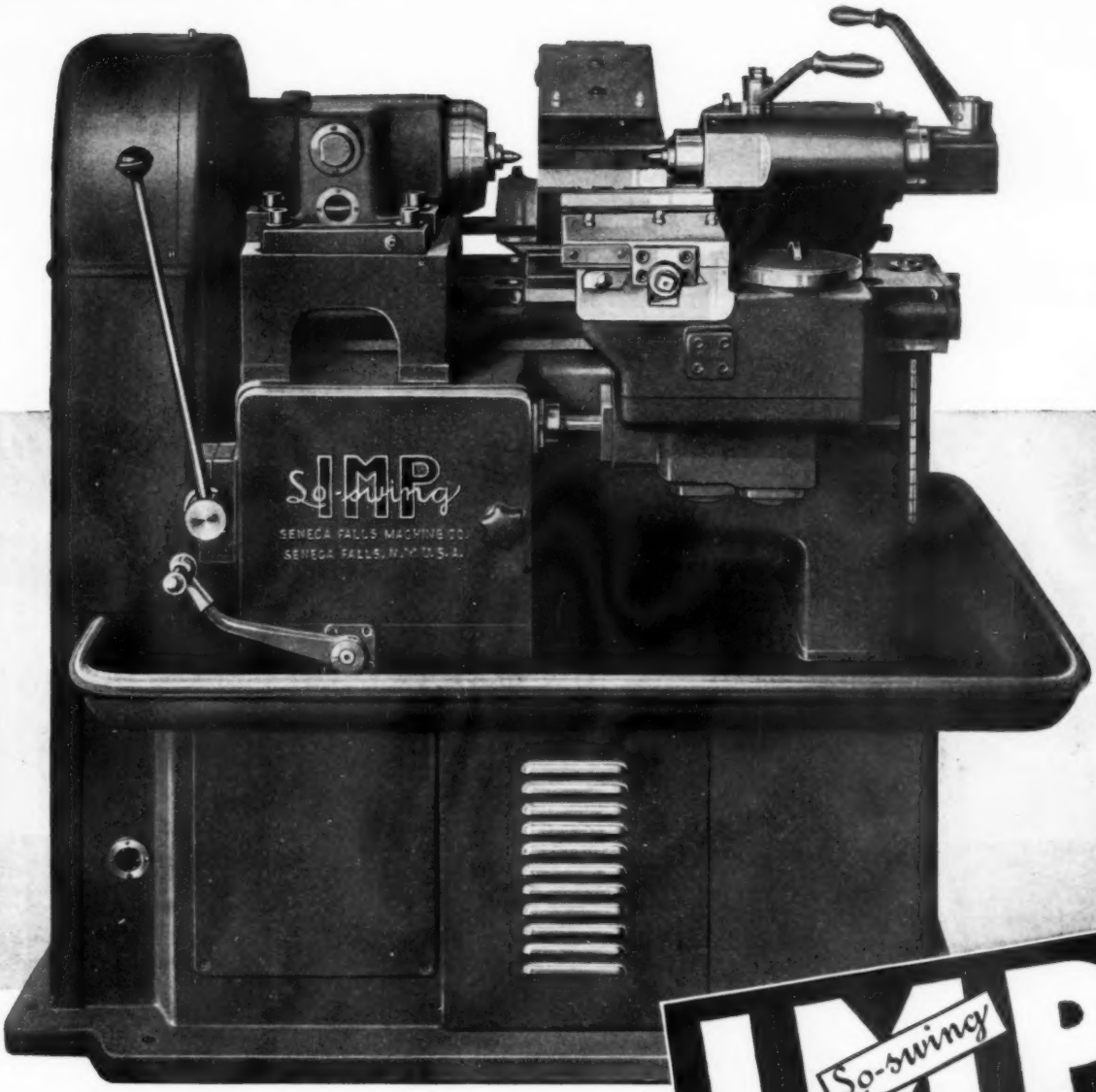
Suburb of Detroit - Phone Centerline 1575

HOVIS SCREWLOCK COMPANY
8098 E. Nine-Mile Road,
Van Dyke, Michigan

Please send me your new illustrated folder showing "THE HOVIS WAY" of making washers.

My Name is .....
Company .....
Address .....
City ..... State .....

A MODERN FULLY-AUTOMATIC LATHE



IMP *Lo-swing*

THE *Lo-swing* IMP Lathe now incorporates many new features, several of which can be credited to the wide experience gained in war production. For small work demanding high speeds, fine finishes and extreme accuracy, the IMP has earned an enviable reputation. Its sturdy, compact design makes it likewise suitable for turning heavier work such as small pistons, bushings, gear blanks, etc.

Because of its integral unit design, the *Lo-swing* IMP lends itself to practically unlimited tooling possibilities. A Third Slide or Over-arm is available for additional facing, grooving and chamfering operations—either roughing or finishing.

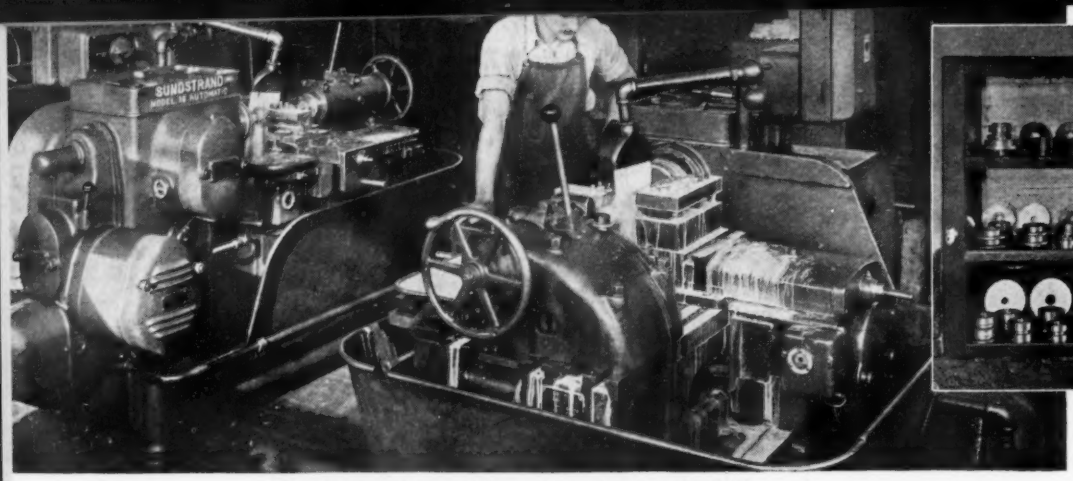
A recently issued Bulletin, No. N 42, fully describes this versatile lathe. Write for your copy today.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

. . . WITH

- **SIMPLIFIED CHANGE-OVER MECHANISM.**
- **SMOOTH, HIGH-SPEED DRIVE THRU MULTIPLE "V" BELTS.**
- **SPINDLE MOUNTED ON SELECTED PRECISION BALL-BEARINGS FOR SPEEDS UP TO 5000 R. P. M.**
- **FINE FEEDS FOR DIAMOND TURNING.**
- **UNIQUE HEAD AND TAIL-STOCK DESIGN PERMITS CARRIAGE SLIDE TO PASS BY.**
- **MANY FEATURES THAT REDUCE SET-UP TIME.**

LATHE NEWS from SENECA FALLS



(Above) One machine used for roughing, while the other finish turns. One man operates both machines on short run work.

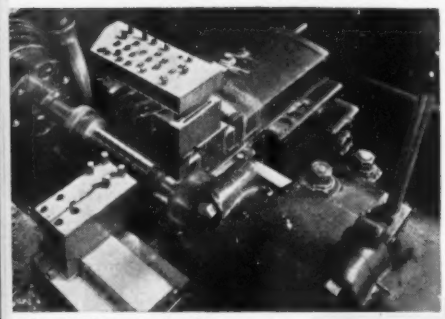
(Above) Some of the different parts turned on the Sundstrand Automatic Lathes. Lot sizes vary from 25 to 100 pieces.

Rough gear blank, rough turned part and finish turned part.

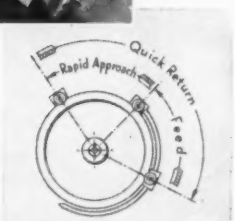
Production Increased 9 Times ON SHORT RUN TURNING

LOTS OF *25 to 100 Pieces* TURNED FASTER ON SUNDSTRAND AUTOMATIC LATHES WITH QUICK CYCLE CHANGE

This progressive machine manufacturer gets maximum production on short run turning. On one, of approximately 100 odd turning jobs, he has reduced the machining time from 45 to 5 minutes. Savings on other parts are proportionate.



(Above) Close-up of tooling set-up for Cluster Gear



(Right and Below) Quick set-up for short runs is accomplished by adjusting dogs on a graduated disk. Cycles are rapid approach, feed and quick return of 250" per minute. No cycle control cams required.

PARTS TURNED INCLUDE CAST IRON, STEEL AND BRONZE

Parts varying from simple gear blanks, cluster gears, sprockets, pulleys, sleeves, etc., in materials including cast iron, steel and bronze, are all turned on two Model 10 Sundstrand Automatic Lathes. Some of these parts are shown above. These are kept on shelf and used in setting up the machine for re-runs.

SET-UP TIME LESS THAN 45 MINUTES

Before installing the two Model 10 Lathes the manufacturer used another type of lathe equipment to rough and finish the cluster gear. The part is now rough turned on one automatic lathe and finish turned on the other. The turning for each operation is done simultaneously and completed in 5 minutes. The number of cluster gears turned in each lot is 30. One operator runs both machines, and set-up time for each is less than 45 minutes.

THESE EXCLUSIVE FEATURES ARE RESPONSIBLE FOR HIGHER PRODUCTION ON SHORT RUN WORK

Quicker set-up and easy change-over are possible because of the Sundstrand simple cycle control. It provides complete control of all cycles by adjustment of dogs on a disk...cams are eliminated. 6 dogs control all cycles. Rapid return is 250" per minute.

WIDE RANGE OF TOOL ACTION

A wide range of action for front carriage tools is provided by three units which can be used separately or in combination to give (1) Angular feed-in and tool relief. (2) Slow-up and dwell. (3) Straight feed-in and tool relief .... Many combinations are possible by making simple adjustments.

HOW TO TURN SHORT RUN WORK FASTER... is illustrated in this 16-page booklet describing the features of the Sundstrand Automatic Lathes. The quick set-up and easy change-over features are described. Write today. Ask for Bulletin No. 111.

LET SUNDSTRAND ENGINEERED PRODUCTION HELP YOU
Our engineers are available to study and make recommendations on a productive machining sequence. They are at your service without obligation. Use this service freely, especially on urgent war jobs. Send complete, accurate information with each inquiry.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

SUNDSTRAND MACHINE TOOL CO.

2533 ELEVENTH ST., ROCKFORD, ILLINOIS, U. S. A.

Plain AND *Porous* BRONZE BUSHINGS DELIVERED ON SHORT NOTICE

...SEND FOR THIS FREE 84 page CATALOG

This catalog lists sizes and prices of hundreds of finished bronze bushings and porous bronze oil-retaining bearings available on short notice. Also features complete range of sizes of cored and solid bronze bushing stock, as well as scores of bronze specialties. Send for this FREE catalog today.

ATLAS BRASS FOUNDRY
INCORPORATED
1911 SANTA FE AVENUE • LOS ANGELES, CALIFORNIA

THIS UNIVERSAL PRECISION INDEXING HEAD

can be used on any tool or surface grinder!

It holds all the tools shown at right, and can easily be adapted to hold many others. Graduated 360° in three planes, for every simple or compound angle. Vernier lever will rotate work collet between indexed points without changing index or location of tool in collet. Accurate . . . useful . . . adaptable. Prompt delivery.

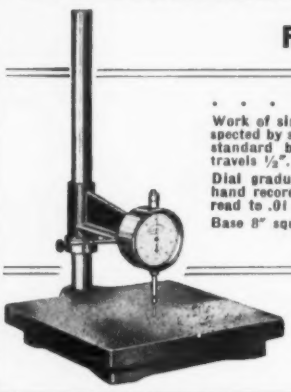
Write for illustrated circular.

1. Straight shank tools up to 1" diameter are held in standard Hardinge collets.
2. No. 4 Morse taper, or conversion collet from No. 4 Morse taper to No. 9 B & S.
3. Also holds tools with No. 9 B & S taper shank.

CLEVELAND TOOL ENGINEERING CO.

9109 DETROIT AVE. • CLEVELAND, OHIO

The RANDALL & STICKNEY Platform Gauge



. . . *takes work up to 7 inches*

Work of similar size can be quickly and easily inspected by setting gauge head at desired height with standard block or plug. Spindle on gauge head travels ½".

Dial graduated 0 to 50 in. thousandths; second-hand records 10ths of inches. Can be furnished to read to .01 mm.

Base 8" square; height 13"; weight 18½ lbs.

Investigate Now!!

RANDALL & STICKNEY

Waltham, Mass.

"ROCKWELL" HARDNESS TESTER

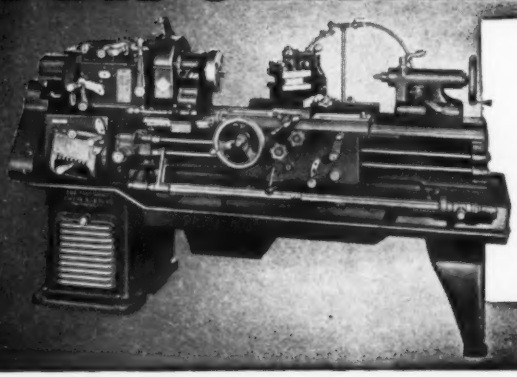
BETTER and BETTER EACH YEAR SINCE 1921

WILSON

MECHANICAL INSTRUMENT CO., INC.

Concord Ave. New York

CINCINNATI LATHES



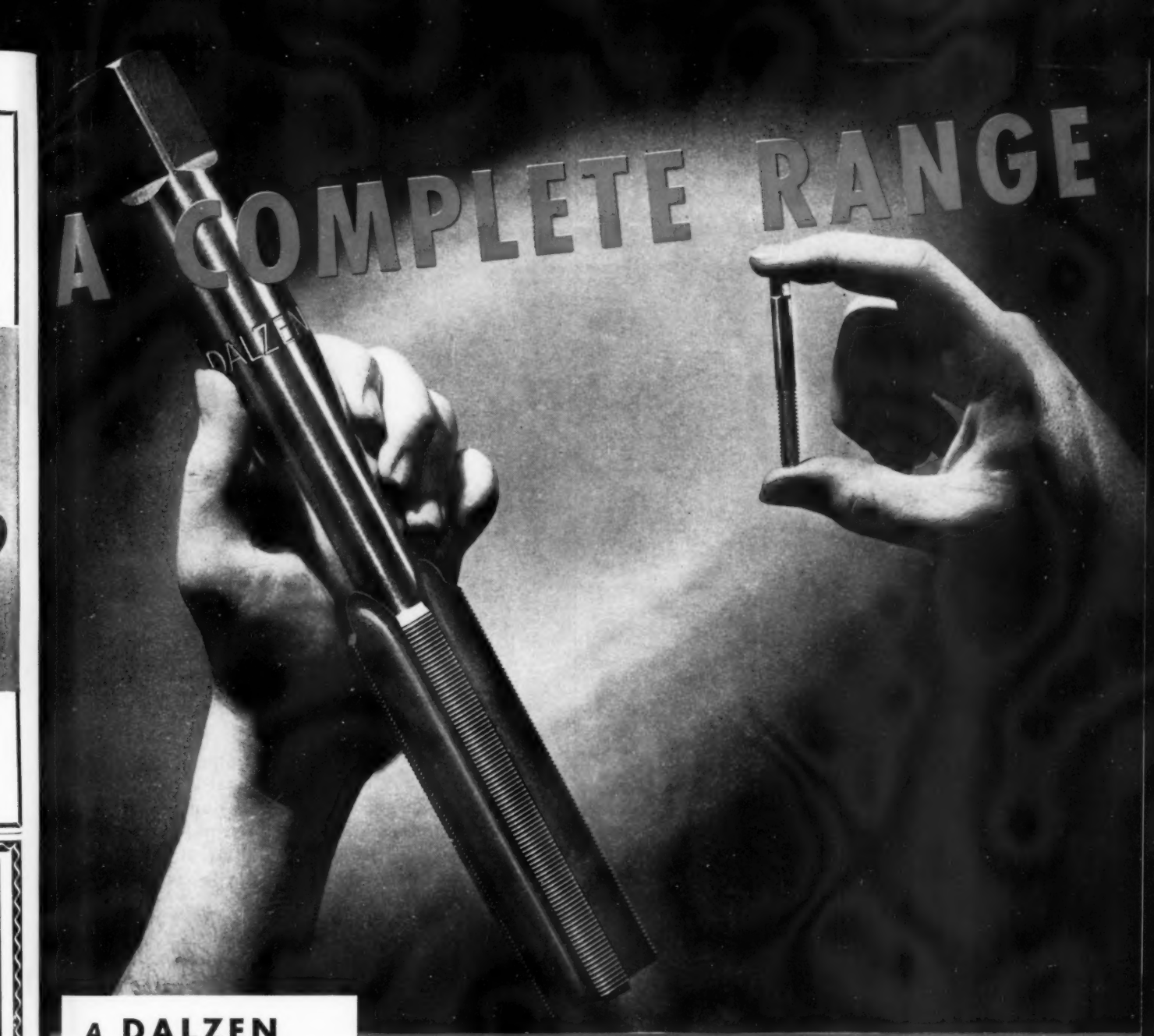
CINCINNATI LATHES

Precision—on High Speed, Heavy Duty Machining

Load up Cincinnati Lathes to their full capacity—take heaviest cuts at highest speeds . . . their rugged construction guarantees constant precision! Built in 14" to 30" sizes, with 12 or 24 speeds and 32 to 96 feeds, they are designed throughout to handle the toughest jobs. Write for complete specifications.

THE CINCINNATI LATHE & TOOL CO.

Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio



A DALZEN *WILL DO IT!*

Dalzen tools — taps, flat and round broaches, thread milling hobs — have the same high reputation for accuracy and dependability as Dalzen Thread Grinders and Center Lapping Machines. Sturdy, compact, efficient, Dalzen machine tools give maximum production per cubic foot, per pound, per dollar of cost! Write for descriptive literature.

DALZEN IN AIRCRAFT

Ground thread parts are being produced on contract for leading aircraft engine manufacturers. For detailed data on this service, submit blueprints and specifications when making inquiry.

WHITWORTH AND NATIONAL FORM GROUND HIGH SPEED TAPS

• You can rely on Dalzen as a dependable source of tap supply. Here's why:

DALZEN CAN DELIVER the size you need with the speed your production schedules require.

DALZEN SPECIALIZES in hard-to-get Whitworth form taps from size 12-BA up to 6" in diameter.

DALZEN TAPS ARE PRECISION GROUND of hardened high speed steel — assure clean, accurate cuts with maximum tool life.

When ordering, give size, form, and quantity data. Prices, descriptions, and earliest delivery date will be rushed.

DALZEN

TOOL & MANUFACTURING CO.

12255 EAST 8 MILE ROAD • DETROIT

DREMEL MOTO-TOOLS SPEED UP WAR PRODUCTION

Dremel Moto-Tools are speeding up war production in defense plants from coast to coast. These rugged tools tackle grinding, routing, buffing and finishing jobs with speed and precision . . . faster and easier, in close quarters . . . in hard-to-get-at places.

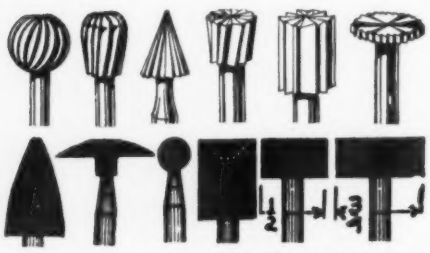
A Dremel Moto-Tool has a shock-proof bakelite housing, oil-sealed bearings, and a balanced armature to eliminate vibration and produce finer finished surfaces. It weighs only 13 ounces . . . can be hooked up to any AC or DC outlet. Used in America's leading arsenals of democracy . . . by General Electric, Westinghouse, Remington Arms, Ford, Nash-Kelvinator, Consolidated Aircraft, Douglas Aircraft, Northrop Aircraft, and many others.

Below: Tool makers find Moto-Tool's sensitive, finger-tip control indispensable when shaping intricate or irregular metal dies. For grinding or cutting with steel accessories . . . it can't be beat for convenience.

Above: Moto-Tool is ideal for getting into close quarters, grinding, buffing and finishing to required specifications. For metal, wood, plastics, porcelain, glass, and other materials.

27,000 R.P.M.

This complete Moto-Tool kit has accessories for all types of grinding, buffing and finishing operations . . . with steel cutting tools and the best abrasives. Consists of 1 Model 2 Moto-Tool with three collets:— 1/8", 3/32", and 1/16", 4 Emery Wheel Points, 1 Dressing Stone, 8 Carving Cutters, 1 Steel Saw, 3 Bristle Brushes, 1 Steel Cleaning Brush, 1 Screw Mandrel with Sanding Discs, and 1 Shoulder Mandrel, one 1/2" Drum Sander. Packed complete in sturdy felt-lined hardwood cabinet case . . . $23.50. Dremel No. 2 Moto-Tool, $16.50.



Dremel emery wheel points, steel cutters and accessories with 1/8" shanks are available for quick delivery in a wide variety of sizes and shapes. They can be used with practically all makes of hand grinding tools. Write for catalog.

10 DAY TRIAL

Try a Dremel Moto-Tool for 10 days in your own shop. See how versatile, how indispensable it can become to fast, accurate work. Order from your industrial distributor, or contact any of the following representatives:

WEST COAST
The Federated Sales Co.
2437 West Valley Blvd.
Alhambra, Calif.

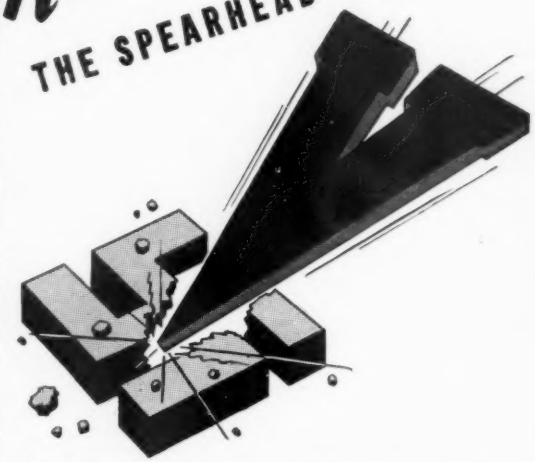
METROPOLITAN NEW YORK
Mill Factor Products Co.
53 West Broadway
New York, N. Y.

NEW ENGLAND
F. V. Fowler, 116 Dartmouth St., West Newton, Mass.

DREMEL MFG. CO., Dept. T473-D, Racine, Wis.

Metal Shapes—

THE SPEARHEAD OF VICTORY



Slowly the Axis crumbles under the relentless blows of America's war implements — implements which RITCO is proud to help build.

For over a century, in wars and peace, we have been working in metals, solving the special problems of customers in many industries. Let our long experience and complete equipment help you in your production problems of today and tomorrow.

Remember RITCO for—

SPECIAL BOLTS, NUTS & STUDS
DROP FORGING & DIE SINKING
SCREW MACHINE PRODUCTS
HEAT TREATING
SPRAYED METAL SERVICE

Estimates gladly submitted. Send samples or blueprints. Catalog on request.

RHODE ISLAND TOOL COMPANY

148 West River St., Providence, Rhode Island

Serving American Industry Since 1834

RITCO

BURIED TREASURE IN YOUR PLANT

Metal Cutting Tools for which you have no immediate use are as valuable as buried treasure. The tungsten, chromium, molybdenum, and other alloys they contain are more precious than pieces of eight. If returned promptly to scrap or to the mill, they will insure a continued and plentiful supply of the high speed tools you need to build the fighting tools American soldiers need!

NATIONAL

NATIONAL TWIST DRILL & TOOL DETROIT U.S.A.

TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
COUNTERBORES
SPECIAL TOOLS

TWIST DRILL AND TOOL COMPANY

HOME OFFICE AND FACTORY—DETROIT, MICH.

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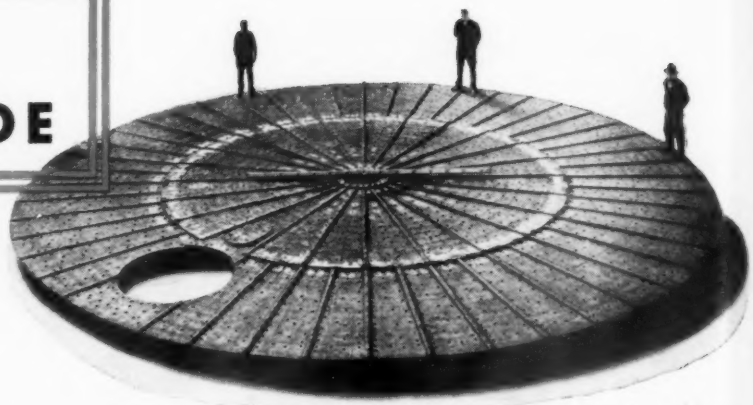
We Can Tell You HOW IT'S MADE



...but ITS USE IS A *Military* SECRET!

The assembly shown is made up of 90 separate castings of heat-resistant ABSCO Meehanite and each casting is so perfect that it fits into its proper place without the need of machining. What this distributor plate will be used for is a military secret, but suffice to say it will be installed in the largest vessel for pressure operation yet designed and is to be used in the production of two most vital war needs. ABSCO Meehanite Castings were chosen for this 41-ft., 65 ton assembly because of its heat resistance and other favorable characteristics.

There are 21 different types of ABSCO Meehanite, all of which provide high strength, vibration absorption qualities and best machinability. Certain types of ABSCO Meehanite respond to heat treatment and flame hardening, thus providing still higher strength and hardness when needed.

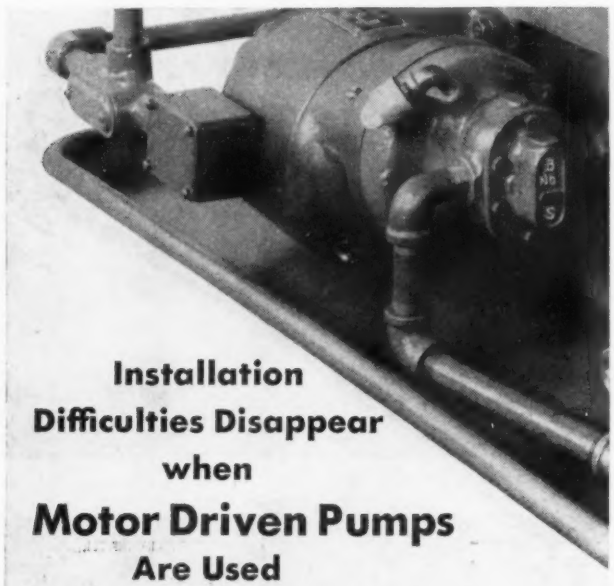
Among the 21 types of ABSCO Meehanite there is unquestionably *one* having characteristics best suited for your particular job. Let us explain how ABSCO Meehanite can help you solve problems involving steel, bronze and other critical materials.

BRAKE SHOE AND CASTINGS DIVISION
230 PARK AVENUE NEW YORK, N. Y.

THE AMERICAN **Brake Shoe** AND FOUNDRY COMPANY

3274

BRAKE SHOE AND CASTINGS DIVISION
230 PARK AVENUE NEW YORK, N. Y.



Installation Difficulties Disappear when Motor Driven Pumps Are Used

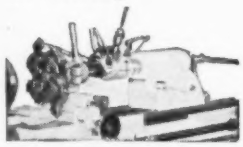
Brown & Sharpe Motor Driven Pumps, both Rotary Geared and Centrifugal, are suited for mounting in almost any convenient position on the machines they serve. Illustration shows geared model installation—horizontal mounting. Send for catalog listing complete line of Geared, Vane, Centrifugal and Motor Driven Pumps. Brown & Sharpe Mfg. Co., Providence, R.I., U.S.A.

B·S

BROWN & SHARPE PUMPS

DON'T WAIT FOR TURRET LATHES

Convert any engine lathe into a turret lathe in 15 seconds with JEFFERSON TURRET ATTACHMENTS. To fit bench lathes and lathes up to 24" swing



● This new modern TOOL-POST TURRET (below, right), made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard tool holders which are easily inserted and rigidly held.

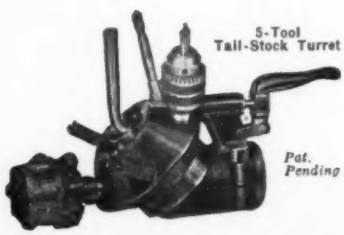
6 Days Delivery

Pat. Pending

4-Tool Tool-Post Turret

● Then there's the completely modernized 5-tool TAIL-STOCK TURRET (below right), made in 4 sizes to fit small bench lathes and lathes up to 24" swing. Also the adjustable PULL-FEED LEVER. Jefferson Turrets are real production tools—substantial, rigid, accurate. They must not be confused with the small make-shift gadgets now on the market.

The Jefferson Bull-Dog Precision Milling Machine. Obtainable Power or Hand Feed.



5-Tool Tail-Stock Turret

Pat. Pending

● **ALSO—*Milling Machine Dividing Heads, Vises, Belt Sanders, Swing Frame Grinders, Gyratory Foundry Riddles.***

JEFFERSON MACHINE TOOL CO.
SO. SWEENEY, CUTTER & FOURTH STS. CINCINNATI OHIO

DoAll FILE CLINIC

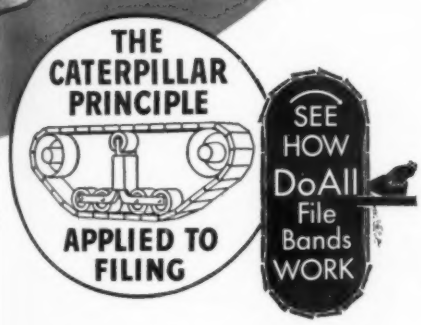
YOUR CLEARING HOUSE FOR TOUGH JOBS

● Industry is taking full advantage of this modern way to better, faster, more uniform filing of any tool or part made from steel, copper, aluminum, and their alloys, ferrous castings, plastics, laminated products, also ticklish and hard-to-finish materials.

Skilled metallurgists and latest equipment, including the new photomicroscope, make this Research Laboratory the best testing ground in the country to overcome filing difficulties. Manufacturers are happy with results and so are we.

Send us one or more actual parts and we'll get busy at once —determine the proper file, best speed, table tilt, coolant, etc. to lick your problem. Costs you nothing — may save thousands of man hours and dollars.

DoAll BAND FILES—Each is made up of a series of 3" segments mounted on a steel tape, interlocked with each other to form an even, solid, continuous, one-way travel surface that gets filing done in 1/5 the time of jig filing, 1/8 that of hand filing.

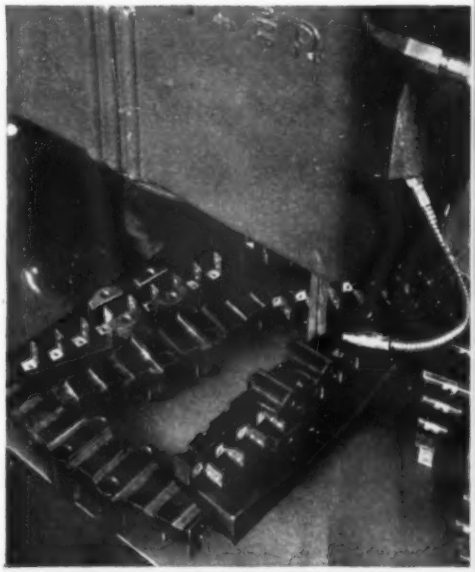


Send for pocket-size Band Filing Book, listing all sizes and styles of DoAll Files.

THE DOALL COMPANY

1210 Thacker Street — **Des Plaines, Illinois**

DoAll Branches in 25 cities, each in charge of a trained sales engineer to give you quick service. Consult your phone book.



BAKELITE TERMINAL BLOCKS

Job sent in by Providence, R. I., manufacturer, to determine the best method to dress off Bakelite and expose the brass inserts. Result: Use ¼" flat medium cut file, 24 pitch, run at 270 f.p.m. Time required—1 minute for 9 faces per block. DoAll File Band lasts 75 hours and machines 4,500 of these blocks.

HOT ROLLED PLATES

Size 3/16" thick, 14" square. To determine time saving through use of band filing, as compared with former method. Result: Use ½" oval, 14 pitch file, run at 85 f.p.m. 50% to 60% saving effected and square, uniform finish obtained.

OTHER FAMOUS DoAll PRODUCTS

DoAll Contour Machines. 8 models priced from $1,000 to $3,000. Continental Machines, Inc., Minneapolis, Minn.

DoAll Band Saws

DoAll Gage Blocks

DoAll Surface Grinders

Savage Tool Company, Savage, Minn.

Here's another 10 seconds the Axis won't get!

You don't stop or slow down the machine to change tools with Apex Quick Change Drill Chucks. And a few seconds saved repeatedly, give you extra *productive* man hours per week per machine.

Green hands catch on quick to these simple, rugged chucks. A flip of the wrist changes drills, taps, reamers, counterbores, etc.—on drill presses, radials, lathes, hand screws, electric and air tools. Plunger design prevents dirt from clogging hole. Ball nose plungers guaranteed not to fall out during life of chuck. Morse taper shanks are standard; others to your specifications. Write for the complete catalog of Apex production tools, No. 14.

APEX

THE APEX MACHINE & TOOL CO., DAYTON, OHIO

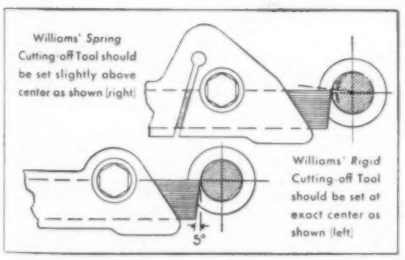
Manufacturers of Safety Friction Tapping Chucks, Quick Change and Positive Drive Drill Chucks, Vertical Float Tapping Chucks, Parallel Floating Tool Holders, Power Bits for Phillips, Slotted Head and Clutch Head Screws, Hand Drivers for Phillips and Clutch Head Screws, Aircraft Universal Joints, Plain and Universal Joint Socket Wrenches.

HOW AND WHY

WILLIAMS' TOOLS AID WAR PRODUCTION

With Williams' Spring Cutting-Off Tool Holder, feed can be applied automatically leaving operator free to watch and thoroughly lubricate the work.

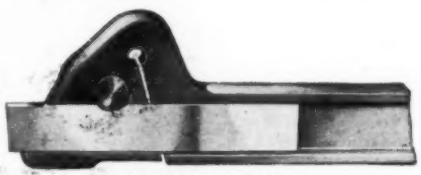
Williams' Spring Cutting-Off Tool Holder makes comparatively simple a lathe operation normally one of the most difficult. Several advantages result from the "goose-neck" design of this Holder which automatically provides relief from any sudden or excess pressure on the cutter blade. Even an inexperienced operator can cut off work considerably out-of-round without chatter, "climbing" or damage to either tool or work. The shock-absorbing qualities of this Spring Head, likewise, tend to protect lathe bearings and journals and will definitely improve the quality of work done on old and "loose" lathes. Only with this type of Spring Holder can the automatic cross feed be used for cutting-off operations.


Williams' Spring Cutting-off Tool should be set slightly above center as shown (right)
Williams' Rigid Cutting-off Tool should be set at exact center as shown (left)
5°

USE OF WILLIAMS' CUTTING-OFF TOOL HOLDERS

In setting-up, the *spring* cutting-off tool should be set slightly above center. A *rigid* cutting-off tool, however, should always be set on exact center. See drawing at lower left. Cutters may be sharpened by grinding the end of the blade — usually to an angle of 5°. The sides of Williams' blades never need to be reground since they have sufficient taper throughout their length to provide side clearance. The work should be flooded with oil when cutting off steel. No lubricant is necessary with cast iron or non-ferrous metals.

WILLIAMS' SPRING CUTTING-OFF HOLDERS



Straight Shank Pattern
Four sizes, 3/8 x 31/32" to 3/4 x 1-5/8".

Right Hand Offset Pattern
Five sizes, 3/8 x 13/16" to 3/4 x 1-5/8".

The above illustrations show two patterns of Williams' Spring Cutting-Off Tool Holders—Straight and Right Hand Offset—and list the sizes in which these tools are available. The same blade fits either pattern in corresponding sizes.

Below are illustrated three patterns of Williams' Cutting-Off and Side-Tool Holder, and sizes listed in which each is available. This Holder accommodates either a cutting-off or side blade without any adjustment. It is a *rigid* rather than *spring* tool. Its cutting-off blade is interchangeable with Williams' Spring Holder. Both these types of Williams' Holders employ a positive cam lock to hold their blades in place, which is both quick-acting and rugged.

WILLIAMS' CUTTING-OFF AND SIDE-TOOL HOLDERS

Right Hand Straight Shank Pattern

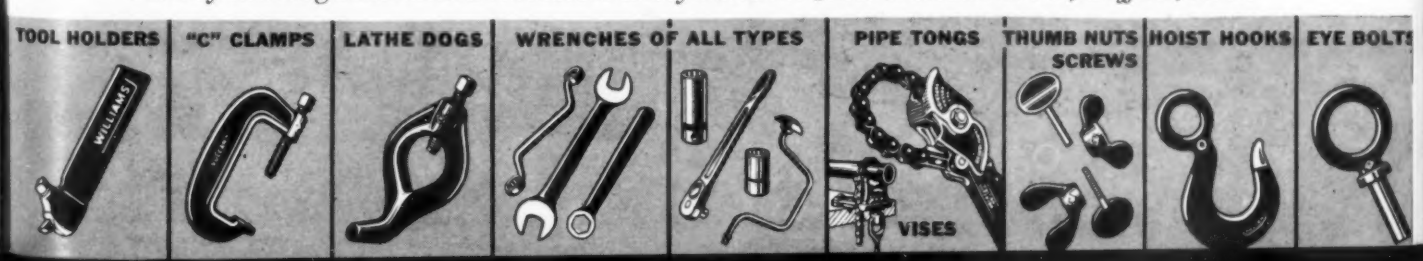
Left Hand Offset Pattern

Right Hand Offset Pattern

All patterns are made in seven sizes, 5/16" x 13/16" to 7/8" x 1-3/4".

WILLIAMS
SUPERIOR DROP-FORGED TOOLS
Headquarters
for over half a century for
DROP-FORGINGS and DROP-FORGED TOOLS

Sold by Leading Industrial Distributors Everywhere . . . J. H. Williams & Co., Buffalo, N. Y.

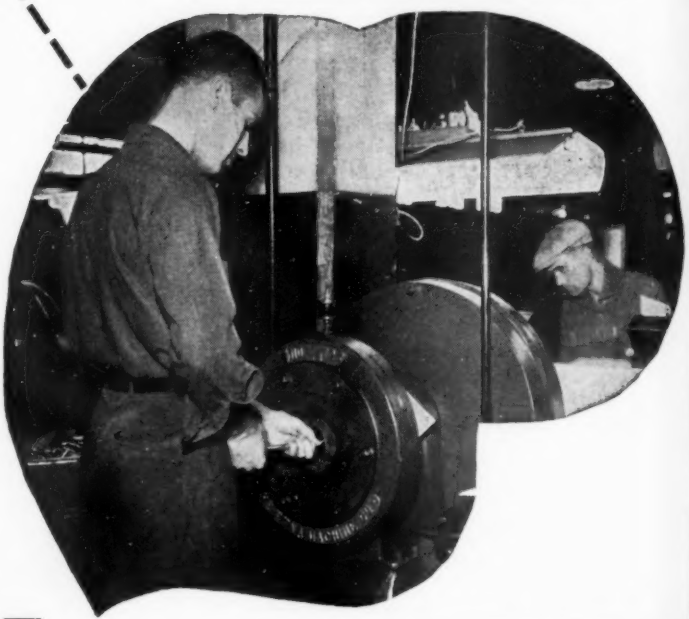


Where operations involve

TAPERING SIZING OR REDUCING

Etnas ON THE JOB

WILL SPEED PRODUCTION!



● Above, in tube-pointing, prior to drawing, this ETNA No. 412 SWAGING MACHINE demonstrates a "natural" operation for ETNAS . . . gives a smooth, clean, open point . . . assures speedy, accurate production.

At right, a No. 72 ETNA swaging copper bands on 20 m.m. shells for direct war-use. The operation is handled rapidly and economically . . . production is surprisingly high.

These examples demonstrate the usefulness of ETNA installations under war conditions, but—*ETNAS are not just "war work" units.* ETNA Swaging Machines on your floor can be quickly and easily applied to normal, peacetime production. Thus an ETNA purchased now is a worthy investment in Today and Tomorrow! Investigate today. Let us show you how swaging can increase production and reduce costs. ETNA units are available in ⅜" to 8" diameter capacities—1" to 18" die lengths. We will build larger units to your order.

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING

"Ask ETNA about Swaging"

THE ETNA MACHINE COMPANY

TOLEDO . . . OHIO

POWER

. . . 1300 TONS OF IT!

Important Defense Plants are using this powerful Watson-Stillman Hydraulic Press for heavy metal-forming work —such as straightening connecting rods between dies. Other hydraulic machines built by Watson-Stillman for all kinds of metal-working jobs, are ready to help you solve your post-war manufacturing problems. Consult W-S engineers NOW, and avoid possible delay later. The Watson-Stillman Co., Roselle, N. J.

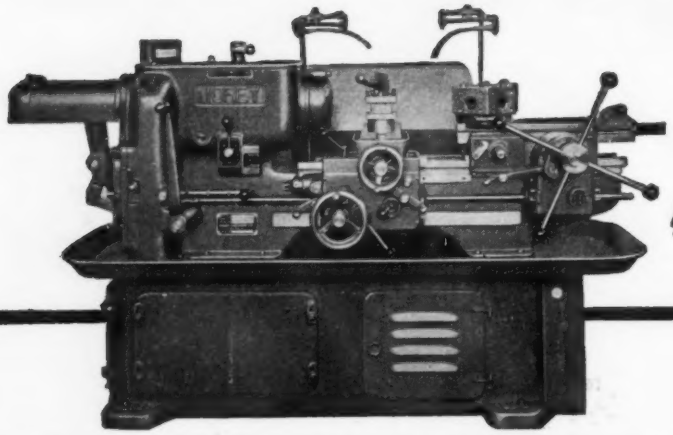
SPECIFICATIONS

- Pressure 2750 lbs. per square inch.
- 22 in. Stroke.
- 37 in. Opening.
- Clear Platen Area—48 in. x 42 in.
- ADVANCE SPEED 650 in. per min.
- PRESSING SPEED 10.5 in. per min.
- RETURN SPEED 650 in. per min.
- Floor space—8 ft. x 6 ft.
- HEIGHT OVERALL—19 feet.

For Victory ★★★ Let's all be Scrappers

WATSON-STILLMAN

Hydraulic Equipment, Valves, Forged Steel Fittings



MOREY DESIGNED AND BUILT
FOR PRECISION *PLUS* PRODUCTION

TURRET LATHES FOR BAR OR CHUCKING WORK

Infinite spindle speeds . . . Multiple disc clutch . . . Power feeds for the turret and cross slide . . . 8 feed changes available...Timken bearing . . . Self-locking turret . . . Automatic stops . . . Turret clamps and unclamps automatically . . . Independent adjustable stop for each turret face.

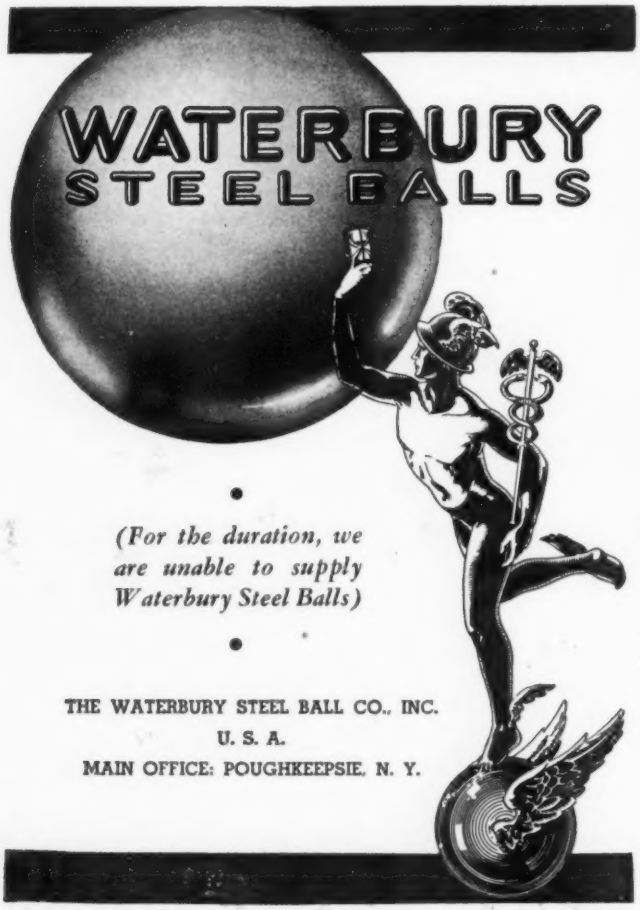
No. 2 TURRET LATHE
1" hole in spindle, 6" turning length, 14" swing over bed. Infinite spindle speeds 60 to 2000 RPM, constant speed motor, 1800 RPM.
Ask for Circular No. 629A

No. 3 TURRET LATHE
1½" hole in spindle, 10" turning length, 16½" swing over bed. Infinite spindle speeds 55 to 1800 RPM, constant speed motor, 1200 RPM.
Ask for Circular No. 727A

No. 4 TURRET LATHE
2" hole in spindle, 12" turning length, 19½" swing over bed. Infinite spindle speeds 35 to 1500 RPM, constant speed motor, 1200 RPM.
Ask for Circular No. 736A

MOREY MACHINERY CO., INC
410 Broome Street New York, N. Y.

WATERBURY STEEL BALLS



(For the duration, we are unable to supply Waterbury Steel Balls)

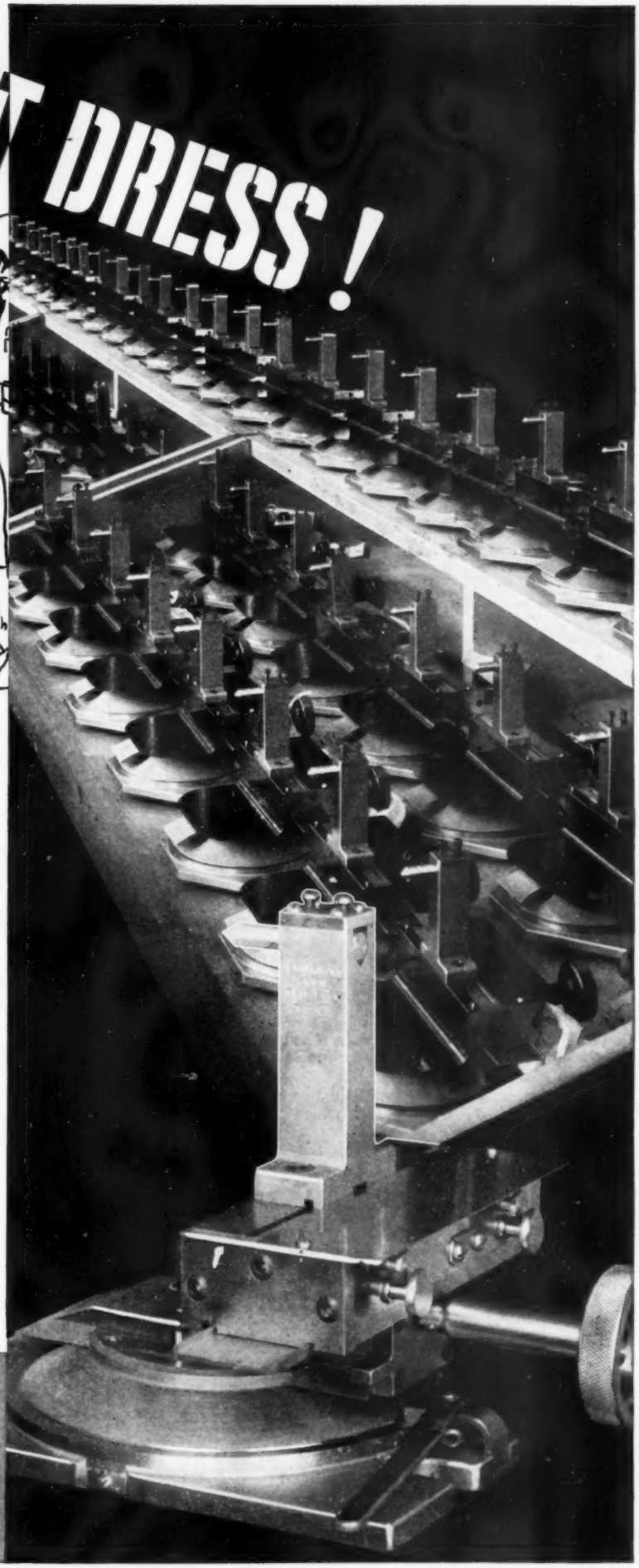
THE WATERBURY STEEL BALL CO., INC.
U. S. A.
MAIN OFFICE: POUGHKEEPSIE, N. Y.

EVERY SMITH SURFACE PLATE IS A *Master* PLATE

Every Smith Surface Plate is a true Master Plate for close tolerance assembly and inspection. Scientifically designed. Precision built. On specifications requiring a total flatness tolerance of one ten-thousandths of an inch, medium size Smith Surface Plates have successfully met the test to the entire satisfaction of hard-to-please users. Tolerance on larger plates in proportion. Prompt delivery on standard sizes ranging from 8" x 12" to 48" x 96". For prices and delivery write, phone or wire.

SMITH TOOL & ENGINEERING CO.
851 N. SANDUSKY AVE., BUCYRUS, OHIO
PRECISION MEASURING EQUIPMENT

RIGHT DRESS!



RIGHT DRESS* for abrasive grinding wheels is sometimes hard to obtain. When grinding wheels are to be dressed to close tolerances, the dresser must be sturdy, flexible, accurate and fast.

RIGHT DRESS* can be obtained, easily and rapidly, by using the VINCO (B-1) ANGLE TANGENT TO RADIUS DRESSER, which combines all of the above requirements. It incorporates the basic patented principle of dressing radii, angles, and angles tangent to radii on abrasive grinding wheels, from the same axis without removing the diamond.

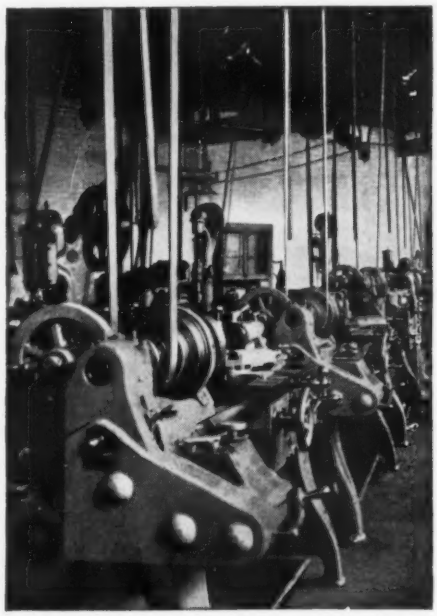
RIGHT DRESS*, with the VINCO (B-1) DRESSER is accurate to within .0001", reducing time and expense, and giving trouble-free service at all times. This dresser can be adapted for use on all surface grinders, and on most external, internal and cutter grinders.

* Remember, the RIGHT Dresser, the RIGHT operator, the RIGHT grinding wheel, mean the RIGHT DRESS, the correct and accurate form for every dressing operation.

VINCO
CORPORATION
8851 SCHAEFER HIGHWAY
DETROIT • • MICHIGAN

MILLIONTHS OF AN INCH
FOR SALE BY
VINCO

The answer to today's No. 1 Problem



TANNATE . . . . . .

FOR MORE PRODUCTION WITHOUT MORE MACHINES!

For primary drives—for modern group drives—for pivoted motor base drives—for maximum power transmission and top machine speeds—*use Tannate!*

Tannate grips tightly, runs smoothly even under adverse operating conditions . . . Resists high temperatures, moisture, machine oils and many chemicals . . . Has high overload capacity . . . Is stronger than most first-quality oak belting . . . Outlasts ordinary belts and keeps production flowing with fewer shutdowns even when run 3 shifts, 7 days a week.

Check this for yourself. We'll be glad to send bulletins which give facts about Tannate advantages and Tannate performance. Or, if recommendations from a Rhoads engineer would help you solve some current drive problem, just call us in.

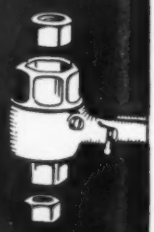
STEP UP PRODUCTION with
RHOADS *Tannate*
WATERSHED LEATHER BELTING

J. E. RHOADS & SONS EST. 1702
35 North Sixth Street, Philadelphia, Pa.
NEW YORK • CHICAGO • ATLANTA • CLEVELAND

TIME SAVER

The only wrench with all these features . . . instantly reversible ratchet . . . heads that fit two different size nuts . . . fits in narrow spaces . . . can be used over long studs. Try it! See why users report 75% faster nut tightening. Three handle sizes...each handle takes five different heads. Carried by leading supply houses.

GREENE, TWEED & CO.
Bronx Blvd. at 238th St., New York



FAVORITE
Reversible Ratchet
WRENCH

MARK IRON, STEEL and CARBIDES

The Original
Etchograph
Way

Mark parts in process, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides—quickly—plainly.
Three sizes to meet all requirements.

Write for circular and prices

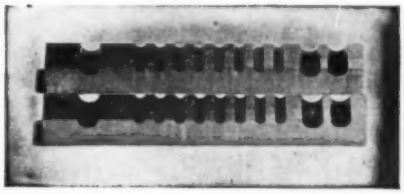
BREWSTER-SQUIRES & CO.
50 CHURCH ST. NEW YORK, N. Y.

DRESSING IS SIMPLIFIED . . . *by the New Time-saving C-66 . . . RADIUS DRESSER FOR SURFACE GRINDERS*

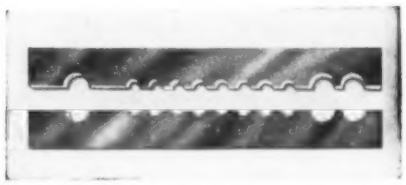
This low-priced, rugged attachment, for any make of surface grinder, dresses wheel without dismantling machine. Mounts directly on magnetic chuck. Does a one hour job in 10 minutes—accurately—conveniently.

NOTE how this Radius Dresser and two High Speed Tool bits replace an expensive Jig Boring Machine.

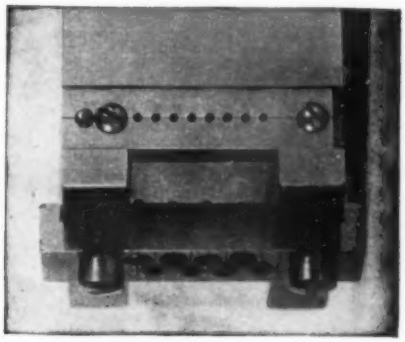
Drill Jig made with two high speed tool bits ground together on surface grinder, eight .062 holes, two screw holes, one dowel pin-hole. No drill bushings, no lapping, no hardening. Grinding time two hours fifteen minutes. Simple, easy, quick.



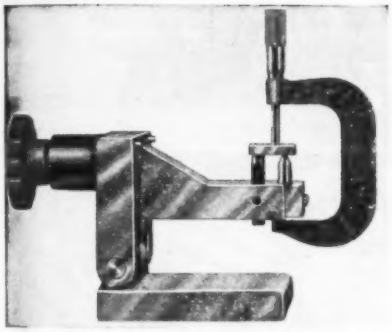
Two High Speed Tool Bits ground for drill jig.



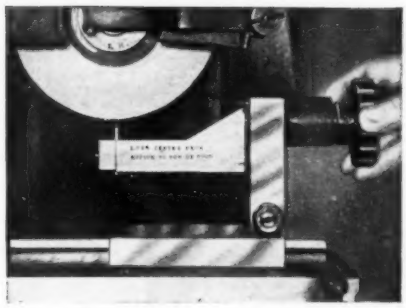
Drill Jig ready to assemble.



Drill jig completely assembled.



The diamond is set by simply measuring with micrometer from top of hood to bottom of arm.



The C-66 provides an important safety feature in that hands are kept away from under the wheel.

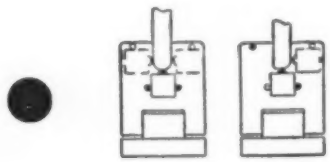
The diamond holder is held against a ground vee in the arm. By means of this construction any size diamond up to 3/8" can be held accurately in line with the vertical center line of spindle.

For dressing wheels for grinding turning tools, the dresser is set at angle equal to clearance angle of tools. The C-66 is the only radius dresser with this feature.

Long Wearing Chisel Point Diamond

.013 Male and Female Radius

.500 Male and Female Radius



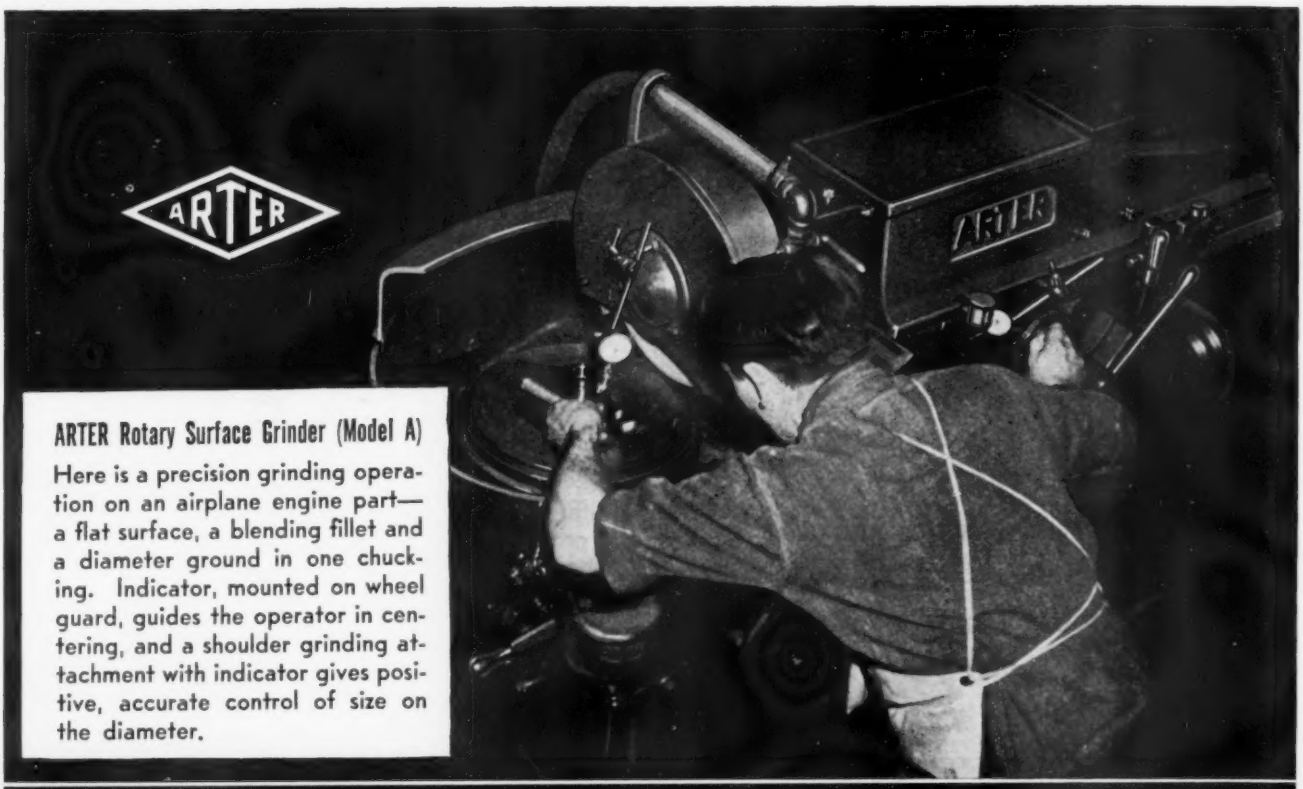
180° and 90° Male Dressing

Prompt delivery from factory in Newark, N. J. Price, without diamond, $82.50, 1/4 K diamond, $5.00.

SCHULTZ & ANDERSON CO.

MACHINE TOOLS

109 C EDISON PLACE NEWARK, N. J.



ARTER Rotary Surface Grinder (Model A)

Here is a precision grinding operation on an airplane engine part—a flat surface, a blending fillet and a diameter ground in one chucking. Indicator, mounted on wheel guard, guides the operator in centering, and a shoulder grinding attachment with indicator gives positive, accurate control of size on the diameter.

ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.

AIR RAID WARNING!

Destruction from the air within many plants takes a toll every day in lost man and machine hours. Tiny particles of abrasive from unprotected grinders and buffers affect workers' lungs and damage expensive machines.

The best defense against these millions of enemy raiders is the Air Master. It traps grinder and buffer dirt at its source. Easy to install, easy to clean. A size for every wheel. Write today for descriptive literature.

The Cincinnati

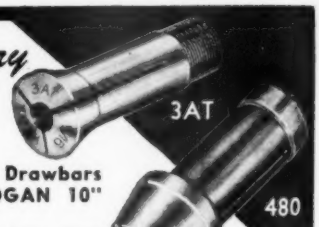
ELECTRIC DRILLS • GRINDERS • BUFFERS • PORTABLE TOOLS

The Cincinnati Electrical Tool Co.

DIVISION OF THE R. K. LE BLOND MACHINE TOOL CO., CINCINNATI, OHIO

2676 MADISON RD

Immediate delivery from stock



- **Collet Model 3AT & Drawbars for ATLAS and LOGAN 10" Lathes**
- **Collet Model 480 for new Logan Screw Machine & Turret Lathe**
  (Same as Warner & Swasey No. 1)
- **Drawbars for 9" South Bend**

Precision Collets and Drawbars

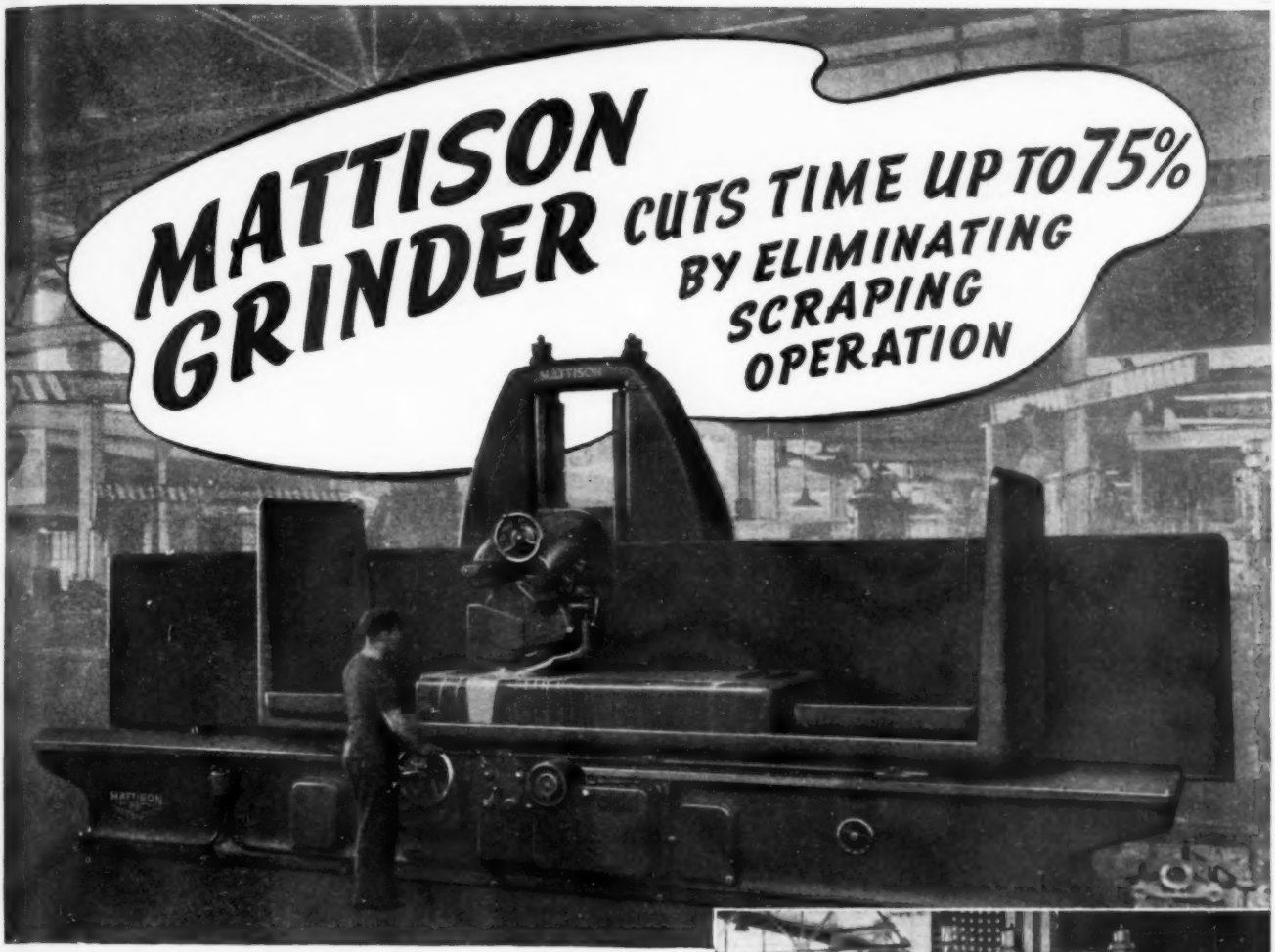
Of importance far beyond their size or dollar value, Collets and Drawbars are vitally needed on the production line and in the tool room. Our ability to deliver immediately from stock during war-time . . . and to deliver with no sacrifice in accuracy, is rapidly giving the *Precision* name an honored place in industry.

When collet work is indicated, specify *Precision*. Your dealer can supply you with these unconditionally guaranteed, longer lasting products. *Literature on request.*

GENERAL DIE—STAMPING—TOOL COMPANY

PRECISION COLLET DIVISION • 265 Canal Street, New York City

MATTISON GRINDER CUTS TIME UP TO 75% BY ELIMINATING SCRAPING OPERATION

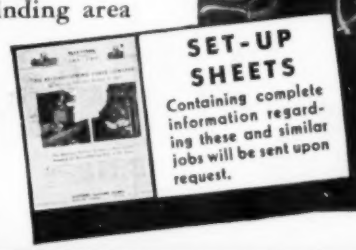


WORK HELD TO LIMITS OF A FEW TENTHS

At the Barnes Drill Co. a Mattison High-Powered Precision Surface Grinder has reduced time up to 75% on a variety of jobs previously hand scraped. Two examples are shown on this page.

The one above shows a housing casting 93″ long and 41″ wide, weighing approximately 2½ tons. An accurate and smooth finish is obtained with their Mattison Grinder, and considerable time is saved through the elimination of the scraping operation. The other picture shows a surface plate 30″ x 36″, which previously was hand scraped. With the Mattison Grinder, time has been cut 75%; the scraping operation has been eliminated, and extremely accurate results are obtained.

The massive double column support, high power and rigidity of construction of the Mattison Grinder, combine with accuracy and speed of operation to provide savings of this kind on jobs previously finished by other methods. A wide variety of sizes are available with grinding area from 12″ to 36″ wide and 36″ to 192″ long. A free booklet will be sent upon request, showing further examples of how the Mattison Grinder is reducing time on small parts as well as those weighing up to several tons.



SET-UP SHEETS

Containing complete information regarding these and similar jobs will be sent upon request.

MATTISON MACHINE WORKS

ROCKFORD • ILLINOIS

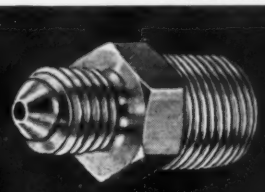
OUT OUR WAY
BY J. R. WILLIAMS
I STILL THINK I'VE BEEN OUT OF TH' GAME TOO LONG TO COME BACK TO IT AT MY AGE!
OH, NO, ALEC--WE NEED YOUR SKILLED HELP BAD AT A TIME LIKE THIS! YOU'LL FIND THINGS HAVE CHANGED SOME!
WHUT'S THE OLD BULL DOIN'? BRINGIN' 'EM BACK OFF TH' SHELF SO OLD THEY HAVE TO HOLD 'EM UP!
I WAS JUST WAITIN' TO SEE HIM TAKE HIS HANDS OFF THE OL' BOY! "THINGS HAVE CHANGED SOME"? ENOUGH SO HE'LL HAVE TO LEARN TH' TRADE OVER AGAIN! HE'S FORGOT MORE'N WE EVER KNEW, BUT IT'S BEST FORGOTTEN NOW!
J.R.WILLIAMS
THE SHELF ROBBERS
T. M. REG. U. S. PAT. OFF.
COPR. 1942 BY NEA SERVICE, INC.

The 'Old Bull's' right...

We've got one job to do...*win this war!* And the harder we work, and the better the products we turn out—the sooner we will be able to enjoy a sound, lasting peace. At the same time, the new skills and techniques we are learning as we produce for Victory—these will be utilized in post-war tomorrow to make this world a better place in which to live. We will be able to put precision on a mass production basis, which means finer, better-made products for *everyone*. And this, in turn, will mean jobs and security for our fighting men when they return home.

(*Below*) A few of the many thousands of our precision-made parts that help "Keep 'em flying and fighting."

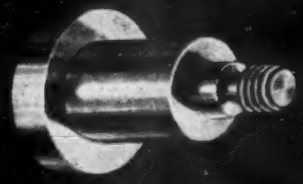
ERICSSON
ESTABLISHED 1911

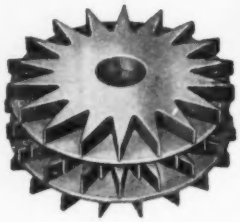


ERICSSON

SCREW MACHINE PRODUCTS CO., INC.

25 LAFAYETTE STREET, BROOKLYN, N. Y.

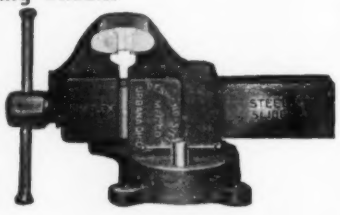




DESMOND
GRINDING WHEEL DRESSERS & CUTTERS

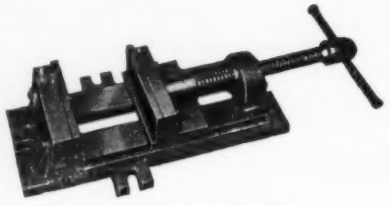
We manufacture a complete line of wheel truing tools and can supply the proper dresser for each of your grinding wheels.

SIMPLEX
Steel Slide
VISES



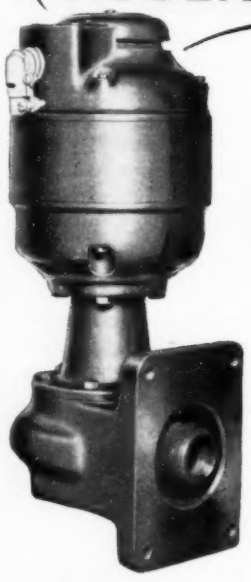
A full line of Machinists, Welders, Filers, Production and Drill Press & Milling Machine Vises with solid steel slides.

Write for copy of catalog "A" and name of your nearest dealer who can supply you.



THE DESMOND-STEPHAN MFG. CO.
URBANA, OHIO

SIMPLE INSTALLATION



Model 11020-A
Internal Discharge Type

Internal Discharge Thru Center of Intake Eliminates outside piping.

RUTHMAN GUSHER
COOLANT PUMPS

Because they are simple in design Gusher Coolant Pumps are trouble-free . . . efficient . . . dependable. They offer you *exclusive and patented* advantages. Suited for today's high speed production. From 1/30 to 2 H.P.

There's a Gusher to meet your needs in our line of immersed, pipe-connected, flange-mounted, plain drive and tank unit types of coolant pumps.

Specify Gusher. Write for data.

THE RUTHMAN MACHINERY CO.
1809 Reading Road **Cincinnati, Ohio**

Largest Exclusive Builders of Coolant Pumps

The Sunnen Precision Honing Machine will help you to

CONSERVE VITAL WAR MATERIALS

The coveted Army-Navy "E" waves over the Sunnen plant — evidence of the important part Sunnen equipment is playing in the war effort.

★ The greater accuracy of the Sunnen Precision Honing Machine assures fewer rejects — conserving not only vital war materials but precious man-hours of labor as well.

Since the Sunnen Precision Honing Machine is usually used to perform the *last* operation, its super-smooth finish and accuracy make possible absolute interchangeability of parts — another time and money saving feature.

Consider These War Production Advantages!

Skilled labor is not necessary! Operators, even girls in 'teens, can be trained in a few hours to handle jobs in "tenths."

The Sunnen Precision Honing Machine is *low in cost* — *economical to operate.*

Relieves big internal grinders for other important jobs.

Wide range — handles internal cylindrical surfaces from .185" to 2.400" in diameter. No *jigs or fixtures* — work is held in hands.

Accuracy within .0001" *guaranteed.*

Put Sunnen Honing to work in your plant!

Write for complete information — or we'll gladly have a Sunnen engineer call and show you what the Sunnen Precision Honing Machine can do on your job in your plant.

SUNNEN PRODUCTS CO., 7941 Manchester Ave., St. Louis, Mo.

Canadian Factory: Chatham, Ontario

SUNNEN

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

Aircraft Valve Tappet Roller. 4-Micro finish.

Drill Jig Bushing "Increases sales appeal of product."

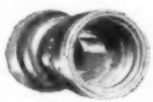
Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

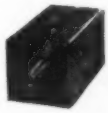
Aluminum Aircraft Link "produces high finish without bell-mouthing."

Drawing and Blanking Die "Saves time in producing smooth base metal finish."

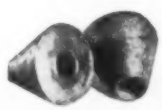
"Strict alignment maintained between two holes."



Aviation Hydraulic Cylinder made of Aluminum-Alloy improves the quality of the bearing surface. An extremely smooth surface-finish is secured.



Saved time in producing a smooth, accurate finish on this bronze remote control valve body.



Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."

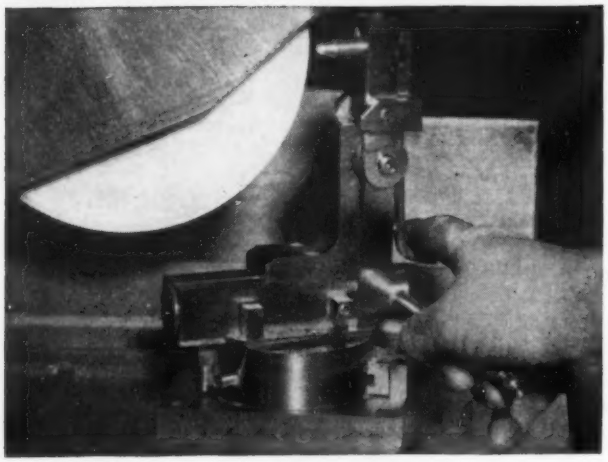
Do you operate precision grinders that require sharp pointed diamonds? Then you require our sharp cornered Octahedrons which you see surrounding this ad.

They are carefully selected by our diamond experts for long wearing qualities. They are not cheap, but they are economical.

Don't delay trying them. Send your inquiry today.

F. F. GILMORE & CO. 285 Columbus Avenue, Boston, Mass.
2834 East Grand Blvd., Detroit, Michigan

A RADII & ANGLE DRESSER
OF PRECISION AND VERSATILITY



An instrument of precision and versatility . . . Operation is simple requiring no high degree of skill for accuracy . . . Any one of the following can be produced with one setting:

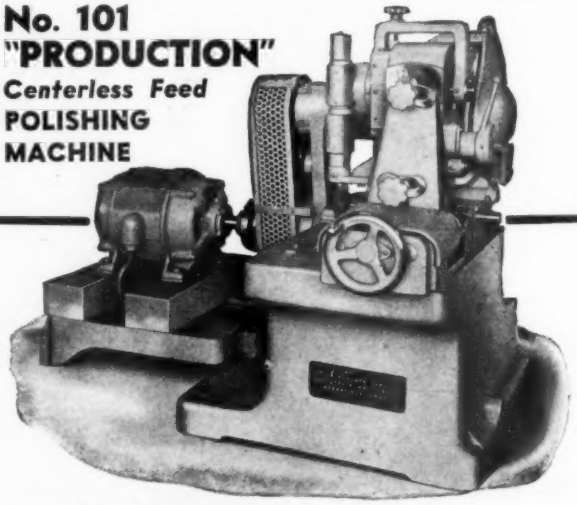
One angle
Two angles
Concave radii up to 6"
Convex radii up to 4½"
Two angles and radius.
Many other diversified forms to meet requirements.

Wheel size capacity—9" dia.; angular travel 3"; for use on universal surface and cylindrical grinders.

Full details available on request.

MANUFACTURED BY
J. & S. TOOL CO. 477 MAIN ST. EAST ORANGE, N. J.
PRECISION DRESSING TOOLS

No. 101 "PRODUCTION"
Centerless Feed
POLISHING MACHINE



. . . for high speed polishing of cylindrical work of all kinds

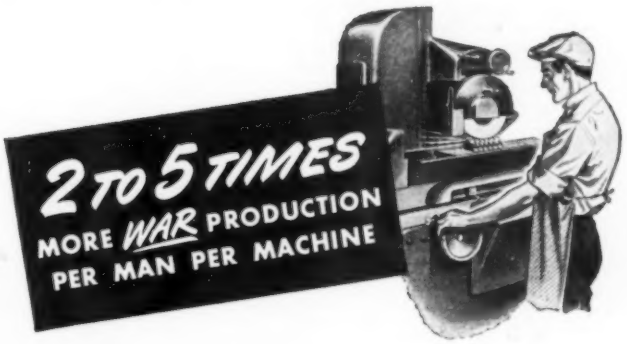
This machine offers big time-savings because no centering, chucking or holding are required, and work is fed automatically. It is particularly adaptable for polishing the outside diameter of tubes, rods, bars and similar cylindrical work. Better work in less time is assured by this machine.

Modern in every feature, this machine is equipped with self-aligning ball bearing mounted shaft, triple V-belt drive, quick adjustment of feed for various work diameters and provision for trueing wheels while in motion.

Send for bulletin giving full details.

PRODUCTION MACHINE CO.
Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
GREENFIELD, MASS., U. S. A.

IMPORTANT NOTICE TO WAR PLANTS CONCERNING POR-OS-WAY DELIVERIES



WE MUST BE FRANK. When we first announced the Por-os-way precision grinding wheel a little more than a year ago, we were ready with a plant far exceeding our previous one in size, equipment and man-power. It was, we felt, big enough to meet all demands. But two things have happened. First, the war. Then Por-os-way, making good its promise to increase grinding production 2 to 5 times per man per machine, has literally sky-rocketed in demand. Hundreds of grinder foremen and grinding machine operators want to prove Por-os-way can up production 2 to 5 times for them, want to see what makes it different from other wheels, how its cool action practically eliminates burning, how it takes cuts double or more than previous wheels and grinds in fewer passes, how it can cut faster producing an even *better finish using a finer grain*, why it resists loading, holds its corner, reduces dressings necessary.

ORDERS INCREASED 700%

Orders have poured in. Not at a steady pace but at an ever increasing rate. Our production is now forging ahead—yet is still not enough to satisfy the full demand for Por-os-way.

RELIEF IS IN SIGHT

Working 'round the clock was not enough. We needed more plant, more equipment, more men. Work on expanding our facilities is now completed. Greatly increased production is now under way. Again we believe it will be amply big enough to take care of all your demands. Naturally we want every war plant to know the exceptional advantages of Por-os-way wheels. And so, we're doing all we humanly can to keep up on delivery. In the meantime, write A. P. de Sanno & Son, Inc., 430 Wheatland Street, Phoenixville, Penna. for a booklet "Facts About Por-os-way". It gives a complete story.

POR-OS-WAY* *a new* RADIAC* PRODUCT

A. P. DE SANNO & SON, INC.
NEW YORK, CHICAGO, PITTSBURGH, CLEVELAND, DETROIT, LOS ANGELES

PHOENIXVILLE, PENNA.
Western Gateway to
VALLEY FORGE

*T. M. Reg. U. S. Pat. Off.

COPYRIGHT, 1943, A. P. de Sanno & Son, Inc.

NOW Your Surface Grinder

Can Sharpen

BROACHES

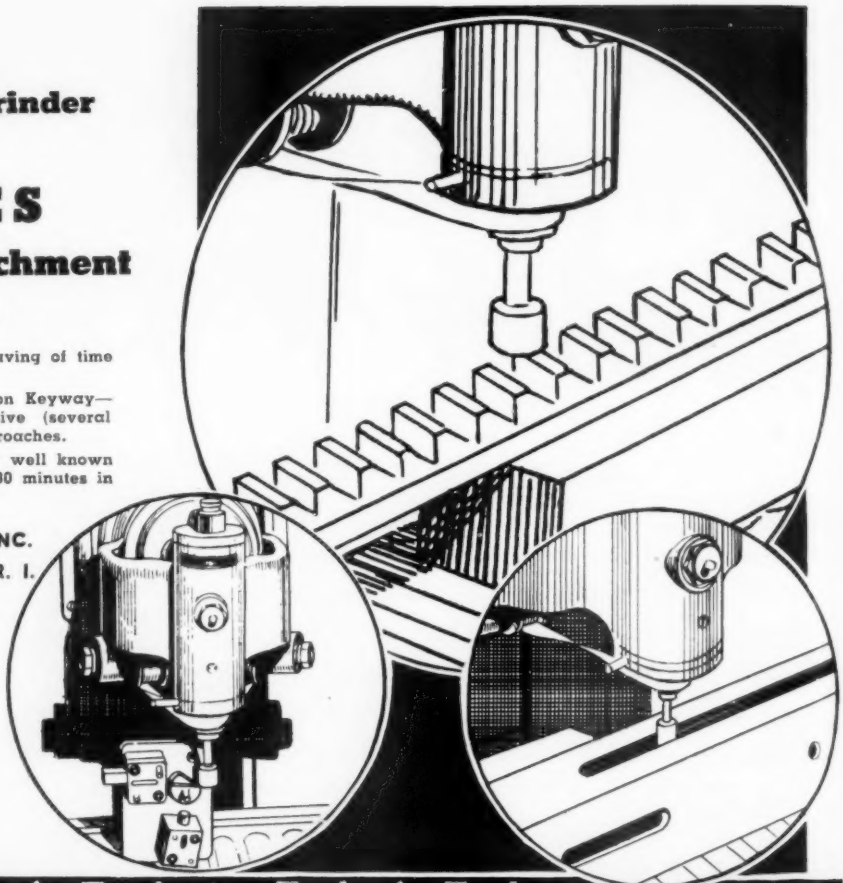
Using LIBERTY Attachment

No. 90–11 Vertical

- Sharpen them in your shop at a real saving of time time and money.
- Liberty does a perfect sharpening job on Keyway—Straight Tooth—Angular Tooth Progressive (several types) Rectangular—Square and other broaches.
- Is quickly and easily attached to many well known makes of surface grinders. Saves up to 30 minutes in set-up time.

LIBERTY TOOL & GAGE WORKS, INC.
241 Georgia Ave. Providence, R. I.

Write for prices giving make and serial number of your surface grinder.



Tomorrow's Tools for Today's Tasks

Boyar-Schultz SMB BOLTS

It is cheaper to use good bolts than to repair the beds of costly machine tools.

SMB Bolts were developed for use in the tool room as well as in the modern busy machine shop. They are tough and strong, and will stand up under heavy working conditions.

Made of special heat treated steel, they are machined with heards square with bodies. This presents a flat surface to T-slot, safeguarding the accuracy of the machine and holding work in exact position for heavy cuts.

SMB Nuts and Washers are MADE for use with SMB Bolts. They also are heat treated and carefully made with threads cut square with face of nut.

BOYAR-SCHULTZ CORPORATION
2109-D Walnut Street CHICAGO, ILL.

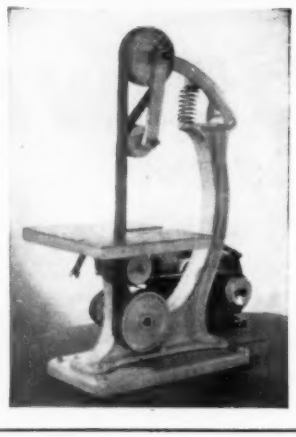
ACROMARK

numbering, stamping and marking machines and accessories are extensively used where fast, accurate permanent work is a prerequisite.

THE ACROMARK CO. ELIZABETH NEW JERSEY

Avey Sensitive DRILLING MACHINES

CINCINNATI OHIO



Industry's New Tool . . .

MEAD BURRING MACHINIST

It is a time, labor and money saver on innumerable jobs in any shop. De-burrs stampings, forgings, castings, finishes & polishes irregular shape.

MEAD SPECIALTIES CO.
15 S. Market St., Dept. 43-Z
CHICAGO, ILL.

THE ABRASIVE INTERNAL GRINDER No. IG

Available for Prompt Delivery

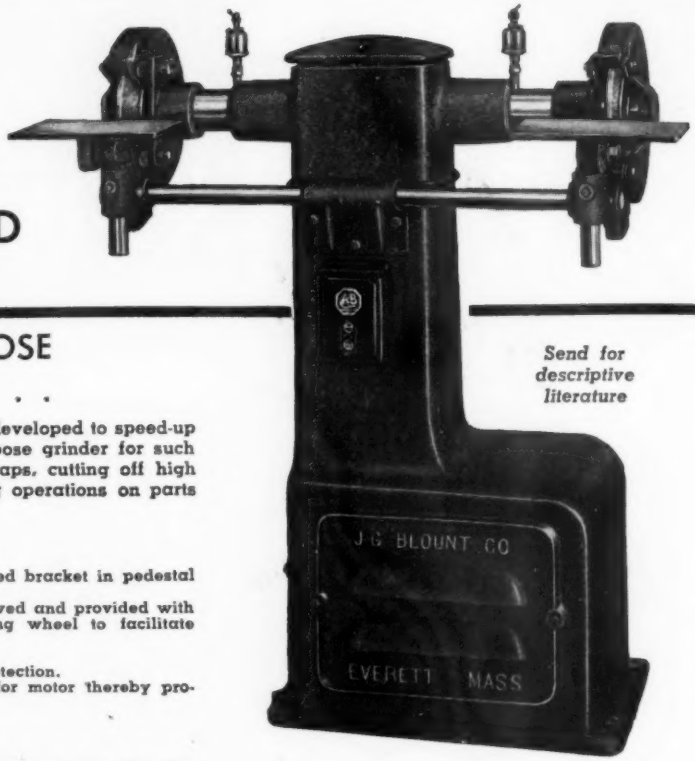
Originally designed for high production work grinding cartridge dies and similar small parts, the Abrasive Internal Grinder No. IG offers unusual flexibility and handles a wide variety of production and toolroom grinding jobs. Heavier in weight than most bench-type grinders, the No. IG is exceptionally rugged and accurate. Work spindle, of machine tool construction, mounted on super-precision ball bearings, is carefully sealed against abrasive grit. Diamond wheel dresser assures accuracy of hole size.

Write for descriptive literature illustrating the unusual versatility and range of this machine.

ABRASIVE MACHINE TOOL CO., EAST PROVIDENCE, R. I.

"Blount"

MODEL H.S. HIGH SPEED GRINDER



A NEW UTILITY SPECIAL PURPOSE MACHINE FOR FAST WORK . . . .

This new BLOUNT machine, of the quill type, has been developed to speed-up war work. It is a high speed notching or special purpose grinder for such use as bevel edge grinding on clicker dies, flutes of taps, cutting off high speed steel tools and many other grinding or polishing operations on parts including gear tooth polishing.

Outstanding features include:

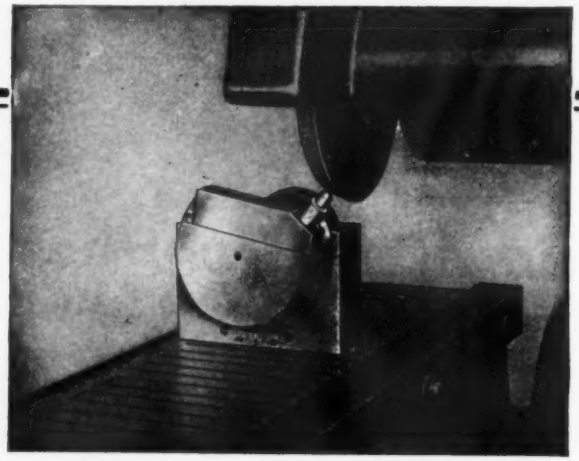
. . . removable high speed precision quill type spindles.
. . . V-belt motor driven quills with motor mounted on hinged bracket in pedestal base.
. . . two adjustable work tables which can be quickly removed and provided with guard adjustment for exposing lower half of grinding wheel to facilitate handling of tool room or production requirements.
. . . quill lubrication through sight feed oilers.
. . . push button manual operated switch with overload protection.
. . . standard equipment includes complete set of pulleys for motor thereby providing wide speed range.

Send for descriptive literature

GENERAL SPECIFICATIONS

Base to spindle center—30"
Tables (2)—10"x8"
Base—22½"x15"
Wheels (2)—10"x1½" (max.); ⅛" (min.)
Wheel arbor—⅝"
Motor—1 HP.
Speeds (spindle) (standard) 9900, 5750, 3570 R.P.M.

J. G. BLOUNT COMPANY *Everett, Mass., U.S.A.*



QUICK ANGLE DRESSER

HE Welch Quick Angle Dresser can be set quickly for dressing the grinding wheel to any desired angle. It is compact, durable; simple in construction. All surfaces are hardened and ground. Furnished in plain or Vernier type. Plain dresser graduated in degrees. . . . Vernier reads in degrees and minutes. The Vernier being an integral part of the base block eliminates any possibility of error. 10 DAYS FREE TRIAL IF DESIRED.

Plain Type, $70 Net

•

Vernier Type, $82.50 Net

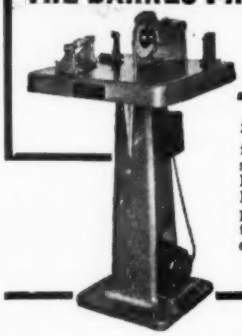
Write for particulars

Welch **INDUSTRIES INCORPORATED**

Makers of High Speed Milling Cutters . . . Form Tools and Special Tools

20,000 West Eight-Mile Road **Detroit, Michigan**

THE BARNES PRECISION CUTTER GRINDER



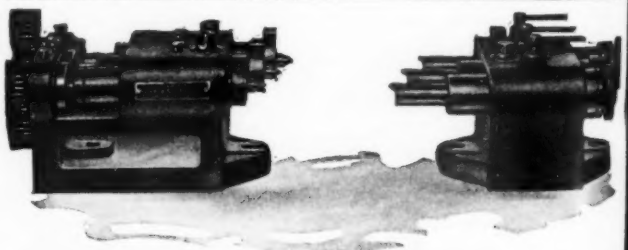
will accurately grind to any PROFILE you require . . .

for example:

fast grinding of formed cutters with assurance of preserving form exactly and lengthening cutter life five to eight times. It will grind gangs of formed cutters—plain, concave, convex or angular—shell tools—shank tools—form turning tools—cutters with undercut and spiral teeth.

Send for Descriptive Circular

GENERAL MACHINERY CORP.
140 Federal St. **Boston, Mass.**



THIRTY YEARS EXPERIENCE MANUFACTURING

MULTIPLE SPINDLE INDEX CENTERS

ADJUSTABLE ANGLE ILLUSTRATED

Three and four spindles of various types and sizes.

Write for circular.

JOHN B. STEVENS INC. • 474 Canal St., New York, N. Y.

THESE OLIVER DRILLPOINTERS • • ARE • • DRILL SAVERS!

At right: The Oliver No. 510 Drill-pointer. Quickly set up for all drills from ¼" to 3" in diameter, for any point angle from 82° to 160°. Cam-controlled action produces the exclusive Oliver hollow ground point.

Above: The Oliver No. 21 Bench Drill Grinder. Hand operated for drills from No. 57 to ½". Attachments available for grinding oil hole drills, left hand and other special points.

By sharpening drills accurately, Oliver Drill-pointers are enabling users to get maximum service — and maximum tool economy — on every drilling job, saving valuable tools at a time when tool-saving is vital!

Oliver Drillpointers enable unskilled operators to produce points that are mathematically accurate in every dimension—points that cut cleanly and accurately, reducing load on both machine and tool. Oliver-ground drills last longer, turn out better work and eliminate the waste of time caused by work spoilage and tool breakage.

Keep every drill in your plant working at top efficiency by equipping your toolroom with Oliver Drillpointers. Write for complete details.

Don't Neglect Your Toolroom It's the Backbone of Production!

OLIVER INSTRUMENT CO.

1410 E. Maumee St., Adrian, Michigan

Oliver OF ADRIAN

AUTOMATIC DRILL GRINDERS — TOOL AND CUTTER GRINDERS — DRILL POINT THINNERS — TEMPLATE TOOL GRINDERS — FACE MILL GRINDERS — DIEMAKING MACHINES

REID 2-C
HAND FEED SURFACE GRINDER

POPE
MAJESTIC
EX-CELLO
MOTORIZED
SPINDLES

CAPACITY
6 x 18 x 14

PROMPT
DELIVERIES

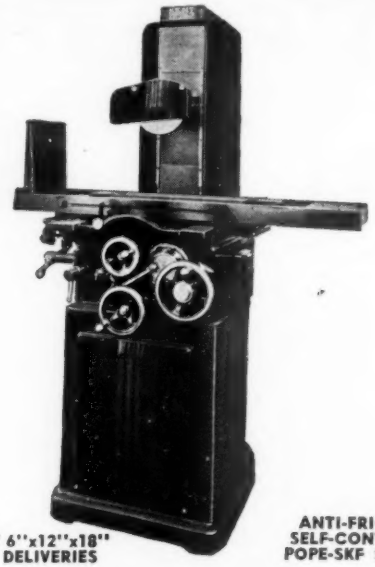
A Proven Product for over a Quarter of a Century
With Thousands in use Daily

Exclusive Selling Agents

H. LEACH MACHINERY CO.
387 CHARLES ST. PROVIDENCE, R. I.

Distributors in All Principal Cities
SEND FOR DESCRIPTIVE LITERATURE

ATLANTIC
No. 2 Automatic Precision
SURFACE GRINDER



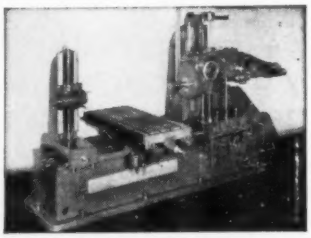
CAPACITY 6"x12"x18"
PROMPT DELIVERIES

ANTI-FRICTION
SELF-CONTAINED
POPE-SKF SPINDLE

ATLANTIC MACHINERY CORP.
149 Broadway New York, N. Y.

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke

THE SMITH & MILLS CO. Cincinnati, Ohio

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

Giant KEYSEATERS

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

Be a Better Turret Lathe Operator!
The New TURRET LATHE OPERATOR'S MANUAL
will help you do better work with less effort

Every man who operates a turret lathe—old-timer, learner, apprentice—can improve his knowledge and handle tooling setups and metal turning jobs more effectively after reading this authoritative volume Written expressly for shopmen by men who have spent the greater part of their lives in building, operating, and improving turret lathes and turning methods. Easy to read. Easy to understand. Covers all phases of metal turning. Explains methods. Suggests short cuts. Contains tables on feeds, speeds, tool angles, threads, hardness conversion charts, etc.,—offered as the most authentic and complete reference book on turret lathes and turret lathe operation. This book can help any turret lathe operator to be worth more to himself and his employer

A DE LUXE EDITION SOLD FAR BELOW COST BY AMERICA'S LARGEST MANUFACTURER OF TURRET LATHES.

240 Pages!
Over 350 Illustrations and Drawings
Only $1.00 Postpaid in U.S.A.
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Operators' Service Bureau of THE WARNER & SWASEY CO.
Cleveland, Ohio, U. S. A.
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GRINDING TIME WAS CUT

from 25 Minutes to 3 Minutes WITH DIAGONAL SHEARING

Briefly—here's the story:

Company: A large manufacturer of automatic screw machines.

Piece: Turret revolving head plate, 21¾" O.D., with broken surface.

Material: Chrome nickel steel casting.

Job: Grinding finished surface on both sides from rough casting.

Machine: Blanchard No. 18 Vertical Surface Grinder; wheel speed 720 R.P.M.; one piece per table load.

SEVERAL tests were made under actual production conditions. Using a Cortland 18" Chuck with Segments the company was able to quadruple the rate of feed, triple the table speed, and cut the grinding time from 25 minutes to 3 minutes—with only a slight increase in power expended. Here's the detail:

	CORTLAND	*Brand Formerly Used*
Stock Removed	Approx. 3/16"*	Approx. ¼"*
Rate of Feed	.032	.008
Table Speed	18	6
Ampere Readings	90-95	75
Dressings Necessary	None	1
Work Heat?	No	No
Grinding Time	3 Minutes	25 Minutes

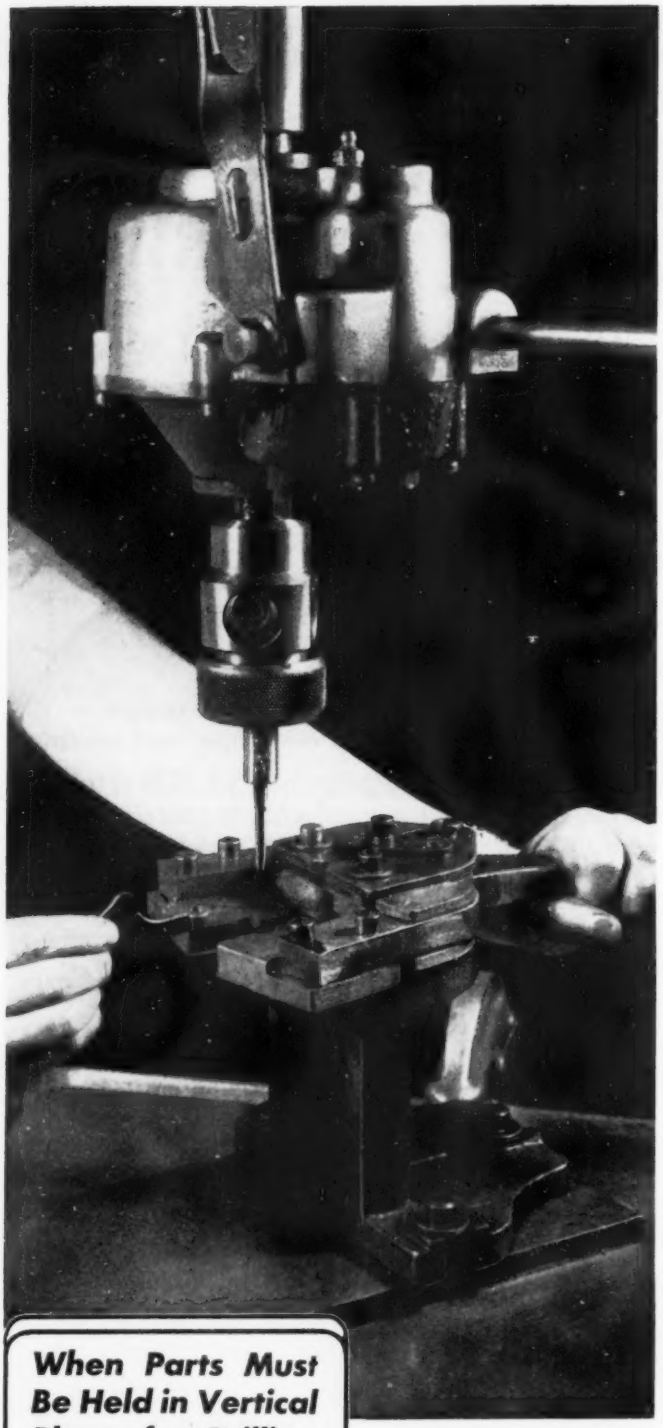
**Stock Removed is approximate because grinding started from rough castings.*

Cortland Production Test Runs in a large number of war plants have already proved the sound common sense engineering back of *Diagonal Shearing*—a feature of Cortland Chuck and Segment assemblies. Write for the Segmental Chuck bulletin—free; and for information on grinding wheels of all types. 7

DIAGONAL SHEARING
Shock and resistance minimized as narrow end of segment starts grinding action. Large surface still exposed to coolant. Diagonal motion of straight inner edge of segment produces powerful shearing action. Increasing contact combines rapid stock removal with minimum heating.
Maximum area of segment in contact with work momentarily. As segment continues to pass across work, grinding area becomes smaller, with more surface exposed to coolant.

CORTLAND *Segmental Chucks*

CORTLAND GRINDING WHEELS CORP. • CHESTER, MASS.



When Parts Must Be Held in Vertical Plane for Drilling or Tapping . . . .

USE THIS

KNU-VISE

FIXTURE

It's a complete fixture in itself—requiring only special jaws that you can make for the particular job at hand—especially efficient for use when small parts must be held in vertical position for accurate drilling, tapping, reaming, milling, assembly, or other operations that are constantly repeated. Every piece is held in exactly the same position—so each operation is duplicated with absolute precision.

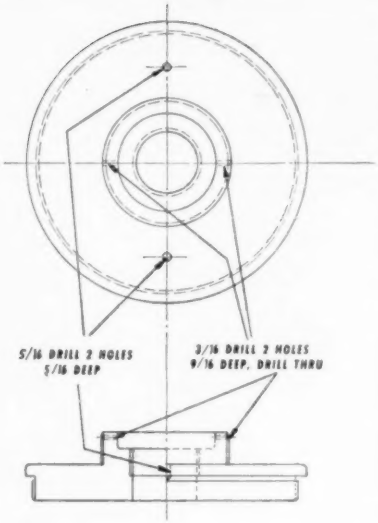
Send for complete catalog with prices

KNU-VISE INCORPORATED

2212 Eighth St., Detroit, Mich.
4328 San Fernando Rd., Glendale, Cal.

HOEFER *3-Way* DRILLING HEAD

MULTIPLIES CAPACITY OF PRESENT MACHINES IN PRODUCING BASE PLUGS FOR BOMBS



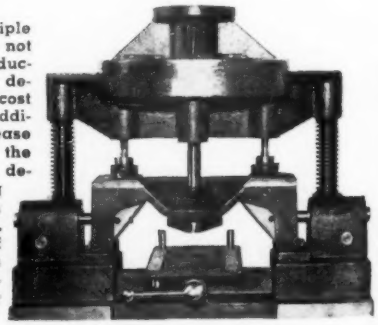
● The main or 2-spindle head is driven by the drill press and has two splined drivers near its outer rim which, through bevel gears drive the two horizontal spindles.

The feeding of all four drills—two vertical and two opposed horizontals—is accomplished by rack and pinion which are covered by the guards shown.

Instead of handling the drilling of the base plug for the four holes from three different directions, one pass of the driller spindle drills all four holes in 1/5 the previous time. Actual drilling time 6 seconds.

ONE PASS of the driller spindle drills all 4 HOLES in one-fifth the previous time.

● Hoefer Multiple Spindle Heads not only increase production per hour, but decrease drilling cost per piece. In addition, they increase production from the same floor space, decrease handling time and lessen operator fatigue. Through use of these drill heads you release needed machines for other work.



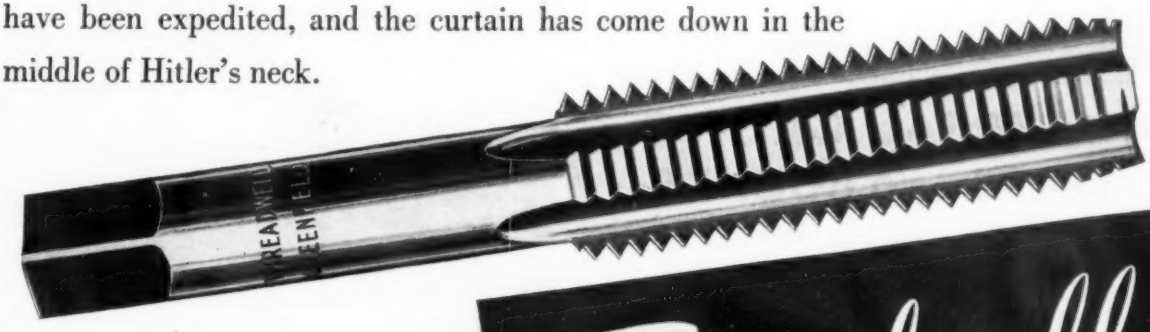
★ The use of Hoefer Multiple Spindle Heads on your present equipment will take care of any drilling requirement. When a part becomes obsolete because of re-design you have only the inexpensive base or support on which the unit is mounted to discard—not the whole machine. Hoefer Heads were designed to meet the need for maximum flexibility and they do it efficiently and economically. Give us an opportunity to analyze your drilling problems—send us your blueprints and number of parts you need for one day. We can design a head that will speed your production, save handling time, and save the need for new costly drilling equipment.

HOEFER MFG. CO. *Freeport, Ill.*

By Threadwell's Personal Attention!

THE "villain" of today's thrilling drama of war production is Herr Bottleneck, super-stooge for Hitler, arch-fiend of subtle sabotage.

TO "foil" this villain, Threadwell has time and again risen to heroic heights. First, by making taps that have broken performance records in many plants. And second, by working with Threadwell distributors to give *personal attention* to each order and inquiry. Thus Herr Bottleneck the Villain has been thwarted, orders have been expedited, and the curtain has come down in the middle of Hitler's neck.



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Export Stocking Distributors
CANADA: BRIDGE MACHINERY CO., MONTREAL
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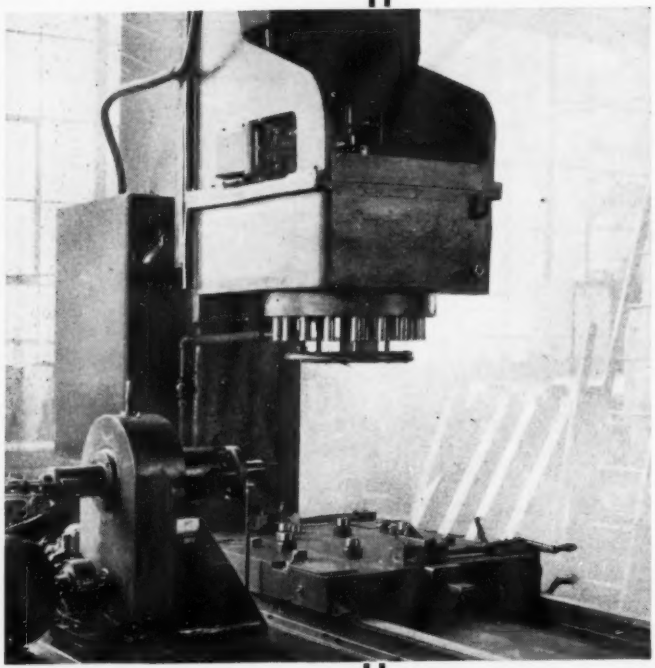
Threadwell
"TAPS OF DISTINCTION"

THREADWELL TAP AND DIE CO., GREENFIELD, MASS., U.S.A., FOUNDED 1902

NO ABSENTEES with



Buhr

MULTIPLE SPINDLE PRODUCTION HEADS

They are on the job 24 hours a day . . . . .

●

17 SPINDLE BUHR TAPPING HEAD

Mounted on a vertical column and direct driven by motor. Circulating oil pump for positive lubrication and vertical adjustment in spindles for tap adjustment.

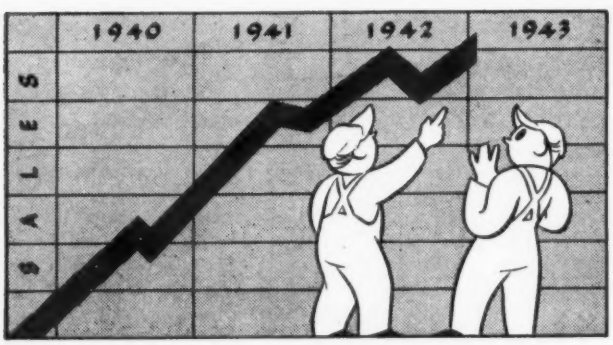
Buhr single Spindle Horizontal Tapper mounted on a bracket and driven direct by motor.

●

BUHR MACHINE TOOL COMPANY

ANN ARBOR, MICH.

Specialists in Multiple Spindle Drilling, Boring, Reaming, Tapping Equipment



UNIVERSAL GROWS BY LEAPS AND BOUNDS

Production of Universal Drill Bushings has doubled each year over the same preceding period for the last three years — proof that American manufacturers demand the best. Universal bushings have superfinished bores which assure accuracy and unexcelled wearing qualities. Write for complete facts.

UNIVERSAL ENGINEERING CO.

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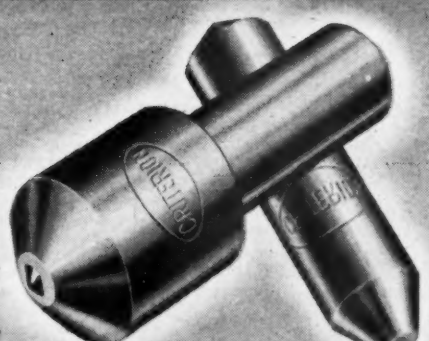
CRITERION *Diamond* TOOLS



For

STEADY PRODUCTION

Dependable diamond tools are vital in present production schedules. Every day more users are turning to Criterion Diamond Tools for the kind of service which they must have. Quality of diamonds used plus a unique method of setting assures extreme rigidity and extra tool life. Special tools made to order following blueprints or specifications. Sharp-pointed, selected thread grinding tools. Order direct. Request free literature.

CRITERION MACHINE WORKS

BEVERLY HILLS, CALIFORNIA

Now get BAKEWELL
precision tapping in an 0-80 size!

All the Bakewell features that enable you to get snug-fit tapping are incorporated in this new bench model No. 0. With either a tapping or threading capacity of No. 0-80 to 8-32 in steels, this latest Bakewell model meets a crying need for the urgencies of Army-Navy threads in small holes.

A precision ground lead screw, operated in conjunction with electro-magnetically controlled brass guide fingers guarantee a thread whose precision is governed only by that of the tap itself.

A super-sensitive clutch protects valuable taps, making it possible to get as much as three times the wear you'd normally expect.

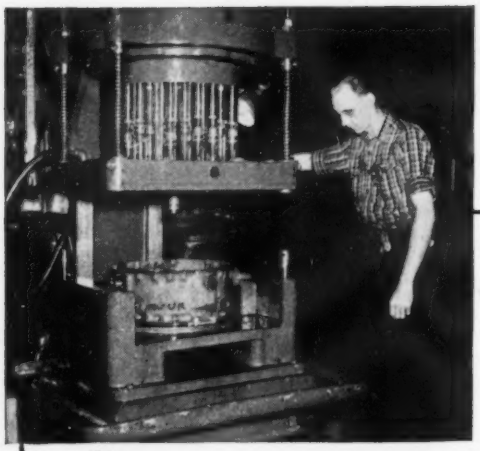
An accurate depth limit stop controls the tapping stroke to within 1/10th revolution of the tap. A wide throat gives a working clearance of 8½" to the column housing the electric controls. The ¼ h.p. motor has a high speed of 1750 r.p.m. with equally rapid reversal.

Accuracy—speed—sturdiness . . . these are the characteristics that make the new Bakewell No. 0 a true companion to the other Bakewell precision tapping machines—that are rapidly giving it a prominent place among the war-winning machine tools of today.

For Your Convenience—
Either With or Without
the Cabinet Base . . . . .

BAKEWELL *Manufacturing Co.*

2023 SANTA FE AVENUE • LOS ANGELES, CALIFORNIA



some tips

ON MODERATE AND HIGH-PRODUCTION DRILLING

In selecting drilling equipment, the required production is the determining factor. Here is some information on multiple-spindle drilling that can be of help in selecting your new drilling equipment.

MULTIPLE-SPINDLE DRILLING MACHINES

Where production warrants, and where the spacing of holes to be drilled permits gears and spindles of sufficient strength, drilling all holes with one pass of the head achieves highest production. The machine shown at the left for drilling 74 holes simultaneously is of standard design with the exception of the fixture and tooling.

INTERCHANGEABLE MULTIPLE-SPINDLE HEADS

Where production is moderate it is often advantageous to use several different drill heads on one machine. One of the parts drilled on the machine shown at the lower left had 66 holes. These were so closely spaced it was necessary to use a 22-spindle head and index the fixture twice.

USE STANDARD BASIC MACHINES WHEN POSSIBLE

Special production drilling problems can best be solved with standard, basic machines. Delivery is faster and your capital investment kept at a minimum. These are but two of many applications of our Hydram Hydraulic Drilling Machines being used on "special" production work. Perhaps one of our basic machine designs can be used on your drilling job. Our engineers will be glad to assist you in determining the correct model and tooling—no obligation.

(*Above*) BARNESDRILL Vertical H-4 Hydram with 74 Spindle Auxiliary Head drilling 74 holes simultaneously in supercharger rear housing cover.

(*Left*) BARNESDRILL Vertical H-3 Hydram with Interchangeable Auxiliary Heads and Interchangeable Fixture Adaptor Plates for drilling 11 to 66 holes simultaneously in various steel airplane brake parts.

FREE DATA: *Write today for data covering complete line of* BARNESDRILL *equipment. Ask for Bulletin A.*

Barnes Drill Co. 830 CHESTNUT ST. ROCKFORD ILLINOIS, U.S.A.

Grand Rapids

DRILL AND TAP GRINDERS

Model 10-B

Other Combinations Also Available

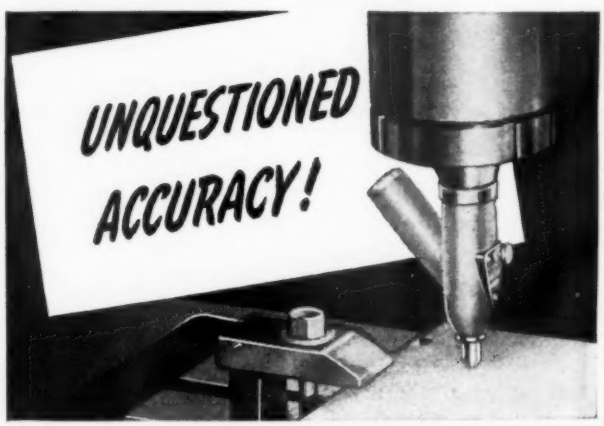
Sharpens Taps, 2, 3 and 4 Flute, Right or Left Hand. Sizes #6 to one and one half inches.

Sharpens Drills, 2 and 3 Flute, Straight or Taper Shank. Sizes from one eighth to one and one half inches.

GALLMEYER & LIVINGSTON CO.

330 Straight Ave. S.W.

GRAND RAPIDS **MICH.**



THE CENTER SCOPE IS AN OPTICAL LOCATING AND CENTERING TOOL—

... whose accuracy is *unquestioned* at all times! It's a handy, rugged shop tool with 45X magnification that can be used directly on the job. With the Center Scope you can quickly and easily locate edges or layouts to a spindle axis within a tenth—set-up faster and easier and compensate for run out. With the Center Scope you can actually *see that you are right*—on every job, because the optical beam or line of sight is inflexible and cannot be distorted. On any machine—the Center Scope is the only instrument that gives you at all times visible assurance of accuracy. Write NOW for the new free 16-page catalog "Unquestioned Accuracy."

CENTER SCOPE INSTRUMENT COMPANY
351 SOUTH LA BREA AVENUE, LOS ANGELES, CALIFORNIA

BAKER
MODEL 30-HO

Offers CAPACITY . . . SPEED . . . VERSATILITY!

ARMY E NAVY

"We are happy to announce that our organization has been officially awarded the Army-Navy "E" as a token of the part we have played in speeding war production."

● Shown here is a special adaptation of BAKER MODEL 30-HO—an inverted two-spindle type drilling machine. The unit has the holding fixture arranged to hold two aviation propellor shafts. This special arrangement permits chucking *two* parts at a time in fixture mounted on saddle and the *completion of two parts on each cycle.*

PARTS HANDLED—This unit is well adapted to:

—handling deep hole drilling operations in airplane landing gear parts such as landing gear cylinders, pistons and sustaining rams.

—deep hole drilling of flanged propellor shafts and crankshafts.

—deep hole drilling where the size of the part is such that it can be chucked in fixture on saddle at the standard center distance of the two spindles of the machine.

(In this case 13")

CAPACITY—Machine has capacity to drive two 4" diameter drills in solid steel, of alloy specifications, at a 40 ft. spindle speed with a feed of .010" per revolution—lends itself to drilling to depths not allowed for on conventional type heavy duty drills.

In design and construction the BAKER MODEL 30-HO represents the ultimate for high-speed low cost production. If you want a machine built not only for the special jobs of today, but also to handle tomorrow's production needs—call in your nearest BAKER representative, or write to us—you'll find BAKER equipped and ready to build a better machine for your job!

BAKER REPRESENTATIVES ARE AT YOUR SERVICE IN THESE KEY CITIES:

ATLANTA	Chandler Machinery Co.
BIRMINGHAM	McVoy-Hausman Co.
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BAKER BROTHERS, INC. • Toledo, Ohio, U.S.A.

DRILLING • BORING • TAPPING

Our Motto Since 1867: "Machines Sturdy and Efficient, as Fine as Can Be Built..."

there IS a difference in taps

in thread GRINDING

All Sossner taps are PRECISION GROUND FROM THE HARDENED SOLID STOCK . . . an important reason for their strength, accuracy, and long life. Sossner taps are made with the very latest equipment, using our own newly developed methods.

TAPS AND GAGES OF AMERICAN NATIONAL AND BRITISH THREAD FORMS IN SPECIAL AND STANDARD SIZES

TAPS · GAGES · STEEL STAMPS · CUTTING TOOLS

SOSSNER

161 Grand St., New York City or 27 B'way, Lynbrook, N.Y.

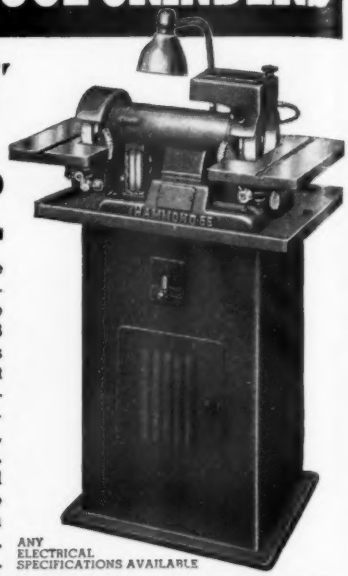
"32 year reputation for precision workmanship."

Hammond

CARBIDE TOOL GRINDERS

NEW **6"**

BELTED MODEL



For fast and accurate silicon carbide or diamond wheel grinding the new Hammond Model 6-B Carbide Tool Grinder is multi V-belt driven. V-belt drive plus precision spindle dampens motor vibration and provides true, smooth running wheels. Wheels wear longer and grind faster because the Hammond 6-B gives you velvet-smooth operation. Write for Bulletin No. 202.

ANY ELECTRICAL SPECIFICATIONS AVAILABLE

Hammond Machinery Builders INC.

KALAMAZOO, MICHIGAN

1618 DOUGLAS AVENUE

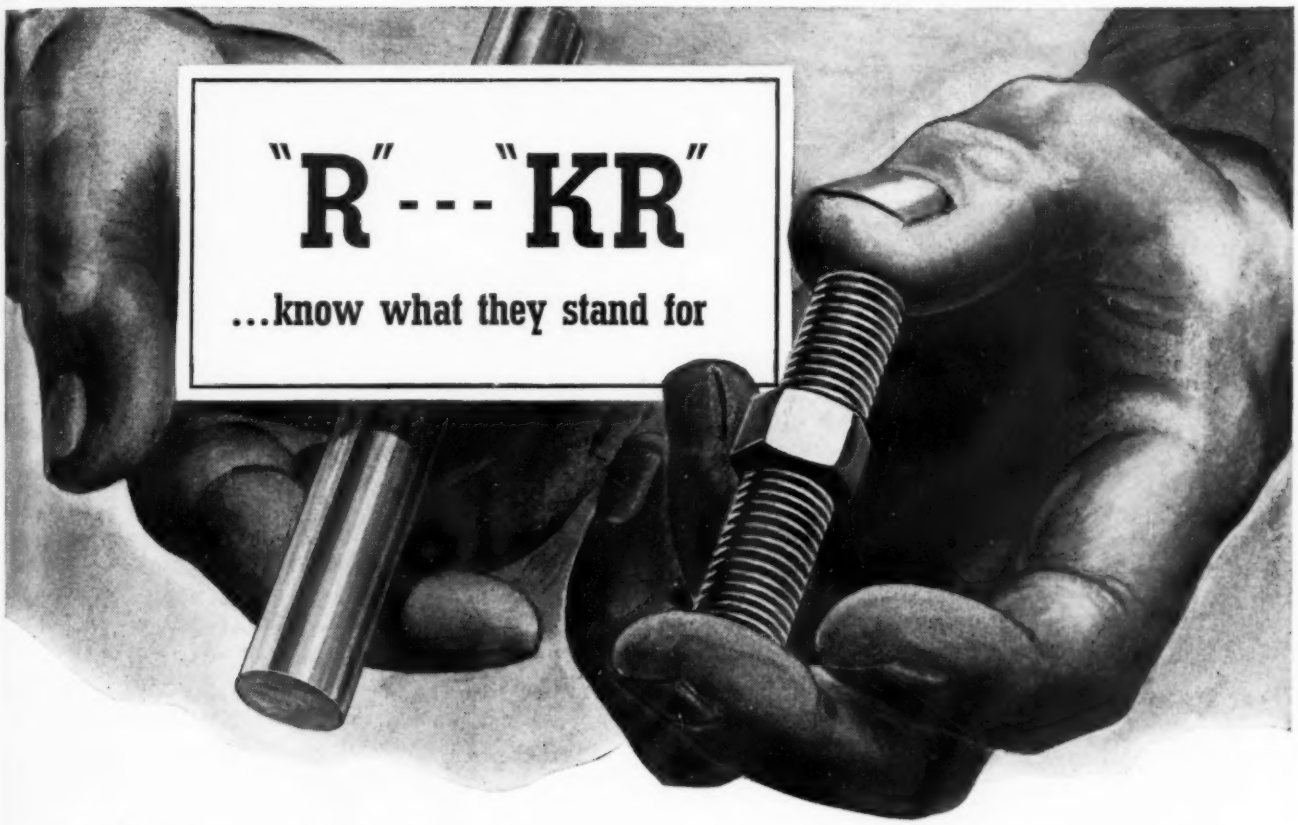
EASTERN BRANCH—71 WEST 23rd STREET NEW YORK, N. Y.

FLATNESS and SMOOTHNESS of Production Parts

The Ultra-Lap machine will finish your parts to a flatness of one light band or less . . . to a smoothness as low as one micro-inch R.M.S., any metal or material. Much faster, more uniform than hand method. Machine designed for you or we shall be pleased to lap your parts on a job basis. Ultra-Lap machines and service used by aircraft and many other war-time industries.

Ultra-Lap MACHINE COMPANY

207 McDOUGALL AVE. · DETROIT, MICH.



Special Monels with Superior Machining Properties

The strength and corrosion resistance of Monel are so well known that they require no comment.

But do you realize that in addition to *regular* Monel, there are two *special* Monels—"R" Monel and "KR" Monel?

"R" Monel . . . When introduced several years ago, "R" Monel made available the properties of Monel coupled with improved machinability.

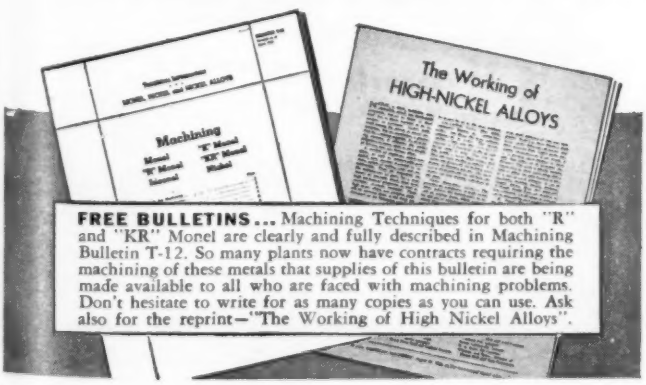
"R" Monel is readily fabricated by cold forming—is produced as hot-rolled and cold-drawn rounds, squares and hexagons. It is ideally suited for the automatic production of rust-proof screw machine parts, yet has mechanical properties equal to steel screw stock (S.A.E. 1112), and is actually tougher.

"R" Monel is NOT heat-treatable. (See "KR" Monel below.)

"KR" Monel . . . The newest member of the Monel family, "KR" Monel, offers machining qualities you wouldn't expect to find in a metal with so many other superior properties—corrosion resistance combined with non-magnetic characteristics, plus exceptional hardness and strength that can result only from heat treatment.

"KR" should be used for screw machine products which are to be heat treated after machining. Remember "KR" Monel as the MACHINABLE brother of "K" Monel, long known for its great strength and hardness. The International Nickel Company, Inc., 67 Wall Street, New York, N. Y.

★ ***SAVE MACHINING TIME AND MONEY . . . Specify "R" Monel and "KR" Monel***



FREE BULLETINS . . . Machining Techniques for both "R" and "KR" Monel are clearly and fully described in Machining Bulletin T-12. So many plants now have contracts requiring the machining of these metals that supplies of this bulletin are being made available to all who are faced with machining problems. Don't hesitate to write for as many copies as you can use. Ask also for the reprint—"The Working of High Nickel Alloys".

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York, N. Y.

Gentlemen: Please send me copy of your Machining Bulletin T-12 and also the reprint "The Working of High Nickel Alloys."

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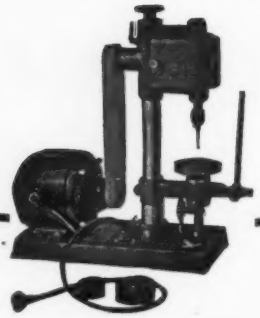
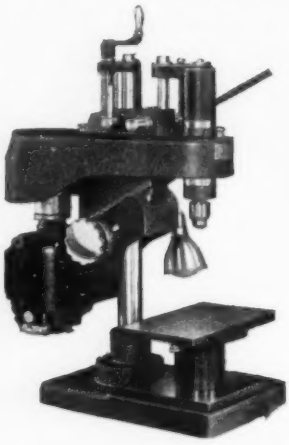


HAMILTON MUEHLMATT SENSITIVE TAPPER

A high production sturdy little machine particularly suited to precision tapping of light work—instruments, cameras, watches, clocks and the like. Easy to operate—can be attached to any light socket.

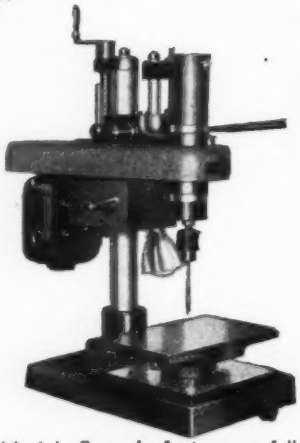


"VARIMATIC"

Built with instrument precision allows instantaneous variable speed adjustment in two ranges. Low range 840—270 R.P.M. High range 2900—9300 R.P.M. Drill capacity .004" to 5/16".

MAXI-JR-E

Designed and built for accurately drilling small holes .004" to .250" diameter. It consists of a self contained drilling unit which swings radially on the column and may be locked in any desired position. This extremely flexible small drilling machine may be ganged for sequence operations or to increase production. Spindle speeds from 750 to 12,000 R.P.M.



The "Varimatic" and the Maxi-Jr.-E each feature a full floating spindle of special design which eliminates radial belt pull on the spindle.

•

Write for full particulars on any or all of the machines shown.

The Hamilton Tool Co.

830 NINTH ST HAMILTON, OHIO

ERRINGTON

STAPLETON, STATEN ISLAND, N. Y.

MULTIPLE HEADS

Super-Sensitive Fixed Center Multiple Drilling Heads

Fixed-Center Auto-Reverse Multiple Tapping Heads

All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles

ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

LELAND-GIFFORD COMPANY · WORCESTER MASS. U.S.A. · MACHINE TOOLS CRANK SHAFTS

Drilling and Tapping Machines

(Automatic and Semi-Automatic)

LELAND GIFFORD CO.

WORCESTER, MASS.

LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine

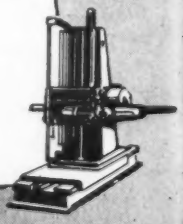
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

GILBERT

PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES



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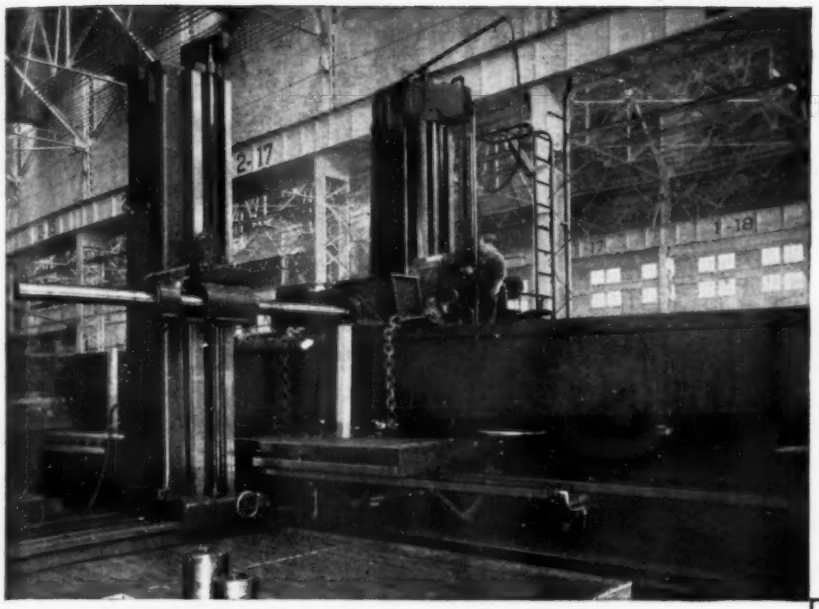
THE CINCINNATI GILBERT MACHINE TOOL CO.

CINCINNATI, OHIO



(*Above*) *Boring 10⅛" Dia. Hole in Gear Case of Boom*

How To Machine Large Parts . . . *in fewer settings!*

10 Operations Completed in 3 Settings of Shovel Boom . . . Wgt. 32,000 Lbs.

(*Above*) 32,000-lb. Welded Steel Boom

Manufacturers of heavy cumbersome equipment can use the versatility of G & L machines to good advantage. The variety of available operations such as boring, drilling, milling, facing *and tapping* often makes it possible to perform numerous operations in one setting. Lost time in moving the part to other machines and resultant inaccuracies are eliminated.

In this installation a 48-ft. long welded steel shovel boom is machined completely in only three settings. Ten operations, including milling, boring, facing and drilling, are performed.

Since the machine table is 25 feet shorter than the shovel boom, great care is exercised in setting it up for machining. All strains of overhang are shimmed out, while ends are supported by jacks. The job is then bolted to the machine table and jacks removed.

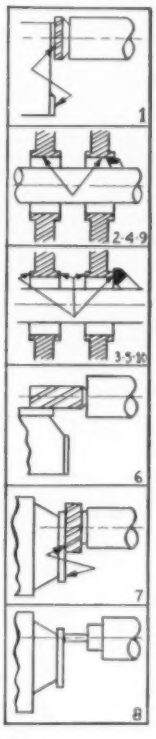
G & L machines are being used for unlimited machining operations on both small and large parts in many industries. With G & L attachments and accessories there is practically no combination of operations that cannot be performed with great speed and economy. Feeds and speed ranges cover all metals, and practically any cutting requirements.

G & L engineers will be glad to make recommendations for faster machining of your work on present or new G & L equipment. They are at your service without obligation.

Versatility:

FOR PROPER MACHINING SEQUENCE AND FEWER SETTINGS

Proper machining sequence is available through ample feeds and speeds and versatility of G & L machines. The ten operations on the shovel boom are shown below:



FIRST SETTING:

OPERATION 1—Mill eight pads for set-up purposes on Operation No. 7.

OPERATION 2—Bore two 10⅛" diameter bores in gear case. (3 cuts, rough, semi, and finish.)

OPERATION 3—Face and back face both sides of bores.

OPERATION 4—Bore two 8.377" holes for intermediate gear shaft.

OPERATION 5—Face and back face both sides of bores.

OPERATION 6—Mill strip on top face of gear case for alignment purposes in Operation No. 7.

SECOND SETTING:

BOOM ROLLED OVER 90° AND PARALLELS PLACED UNDER PADS MILLED IN FIRST OPERATION

OPERATION 7—Mill top of gear case.

OPERATION 8—Drill twenty-two 1 1/16" holes in gear case cover flange.

THIRD SETTING:

BOOM TURNED AT ANGLE OF 39° 14' 17" TO CENTER LINE OF SPINDLE

OPERATION 9—Bore two 5½" holes for worm drive.

OPERATION 10—Face and back face both sides of bores.

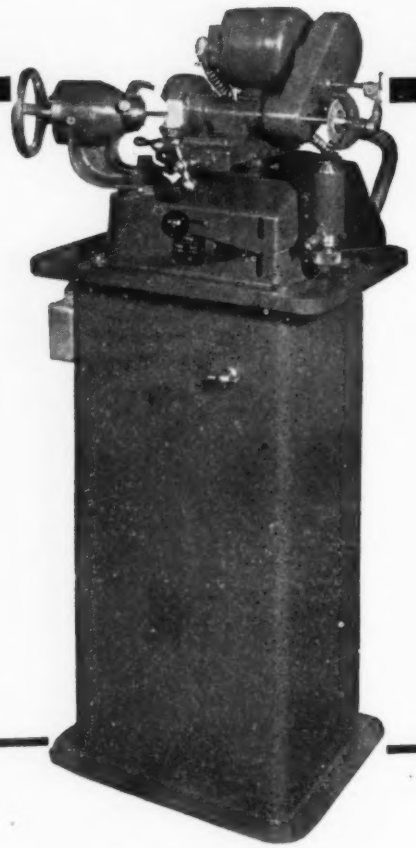
GIDDINGS & LEWIS MACHINE TOOL COMPANY

138 DOTY ST., FOND DU LAC, WISCONSIN

Free Data — *Information covering the complete line of G & L machines and time-saving attachments and accessories is included in this catalog. Write for your copy. Ask for Catalog No. 42.*

G&L

HYBCO *Tap* GRINDER



Sharpens all the vital points

● A complete tap reconditioner — sharpens CHAMFER—FLUTES—and SPIRAL POINTS such as gun, chip driver, etc. Belt driven precision ball bearing spindle permits use of any type motor. Three models — Bench — Floor — Floor Exhaust.

Capacities: Machine Screw to 1½" hand taps, 2 to 10 flutes right or left hand, using interchangeable heads.

ALL TAPS HELD BY SHANK

Taps can be sharpened after center is destroyed

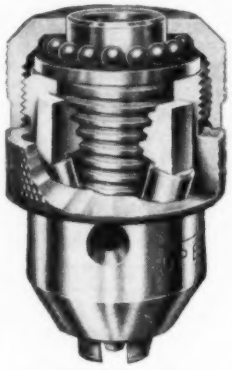
Write today for circular

HENRY P. BOGGIS CO.

1279 W. 3rd St., Cleveland, Ohio

NOW there's another good reason for using . . .

Ettco-Emrick KEYLESS DRILL CHUCKS



WRITE FOR BULLETIN No. 6

which gives full details of the 5 sizes for No. 0 to ⅝" drills.

•

Ettco-Emrick Keyless Drill Chucks are also available for portable drills.

That keyless feature has always been one of the biggest advantages of Ettco-Emrick Drill Chucks. By eliminating the non-productive key-tightening operation it saves time and energy and speeds up drilling—more important today than ever before.

But now, with more and more women operators, the keyless feature takes on added importance because no strength is required to set up drills so they will be tight—and stay tight.

All the operator has to do is place the drill in the chuck and turn the body by hand just enough to hold it. Drilling action does the rest—and the heavier the load the tighter they hold—which means drills simply can't slip so there's never any need to stop and retighten. Yet the design is such that they can be loosened up by hand as easily as they can be tightened.

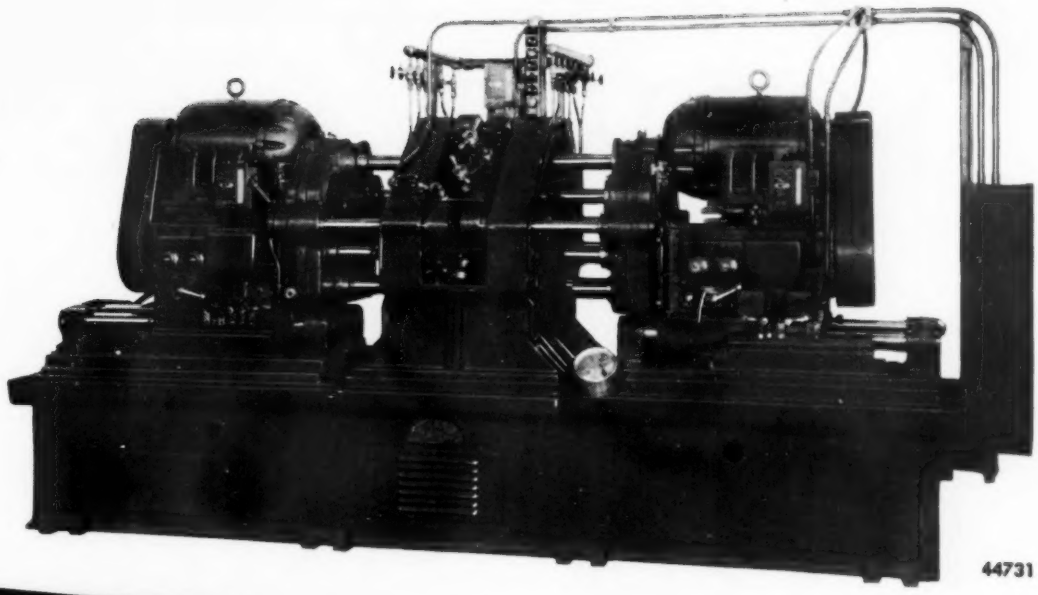
Whether you have men or women operators your drilling is bound to go faster with Ettco-Emrick KEYLESS Drill Chucks. What's more you will get long, hard service from these chucks because they are designed and built to the highest standards of precision tool quality. There are none better made.

ETTCO TOOL CO.

590 Johnson Ave., Brooklyn, N. Y.

Detroit ● Chicago

The Famous *Ettco-Emrick* DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship



44731

Drilling and Semi-Finish Boring Aircraft Pistons from Two Sides

This hydraulically operated, double-end drilling and semi-finish boring machine was designed and built by Snyder to drill the wrist-pin hole in aircraft pistons. It operates semi-automatically through one loading and three successive working stations.

Two pistons are located and clamped manually in a fixture, four of which are mounted on a four-station trunnion index unit. This unit is indexed from station to station by an electrically driven Geneva index mechanism placed near the trunnion housing.

When the parts are in place, the operator pushes the cycle button and the pistons are indexed to the first drilling station. Feeding into the pistons from both sides are tools driven by 6-spindle multiple heads mounted on guide bar units. In the second working station, the pistons are redrilled and in the third, semi-finish bored. Each set of six spindles is operated by a 10 h.p. motor.

In the first and second stations, tools are guided in conventional drill bushings; in the third, the single-tool, semi-finish boring bars are guided by revolving bushings on the trunnion side members.

Coolant, from a large tank near the rear of the machine, is directed against tools and work for efficient machining in all working stations. The top of the coolant tank is a removable chip tray.

If your problem is higher production at lower unit cost, Snyder invites your inquiries.

SNYDER
TOOL & ENGINEERING CO.
3400 E. Lafayette Ave. • Detroit

designers and builders of machinery for HIGH *production at* LOW *unit cost*

FOR VICTORY

BUY UNITED STATES WAR BONDS AND STAMPS

"By the rude bridge that arched the flood,
Their flag to April's breeze unfurled,
Here once the embattled farmers stood,
And fired the shot heard round the world."

Emerson

April, 1775 . . . and a shot heard 'round the world. April, 1943 . . . and war itself goes 'round the world. As the embattled farmers won liberty and freedom from oppression *then,* so must the United Nations win *now.* ★ Day and night our organization does its bit, gives its very best. We give our sons, conserve resources, buy war bonds and . . . because they are tools that are vital for Victory . . . with *all our might* we are ➡

Building *Hy-Draulic* Machine Tools As Fast As It Can Be Done Right

Hy-Draulic
Reg. U. S. Pat. Off.

Shapers..Planers..Slotters..Shaper-Planers

ROCKFORD MACHINE TOOL CO.

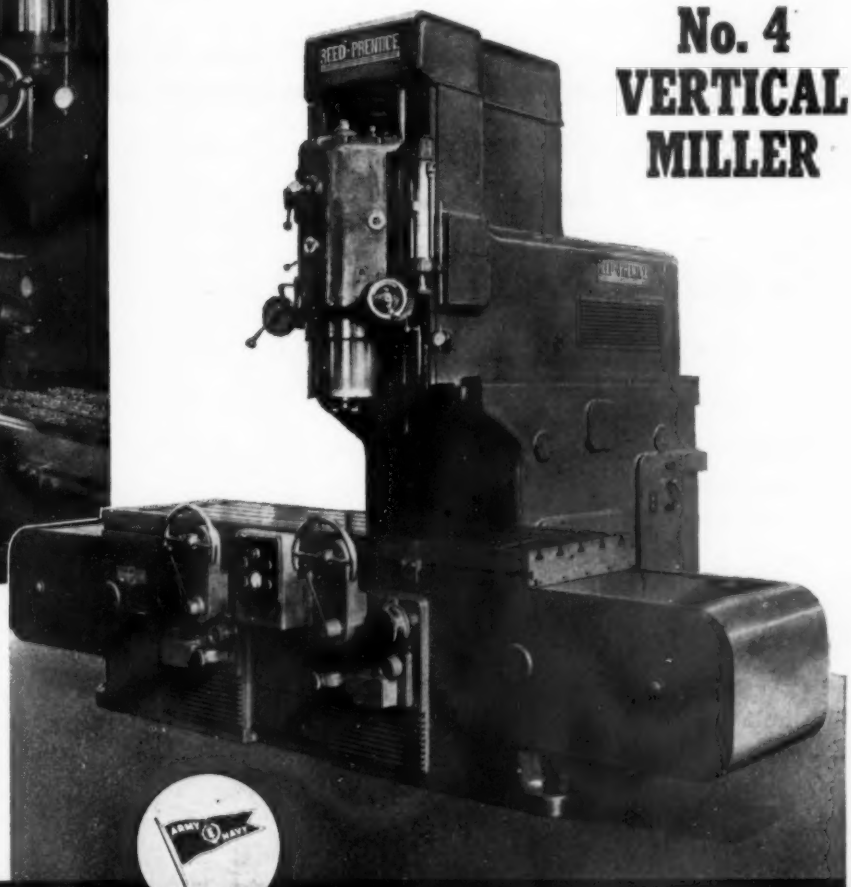
ROCKFORD, ILLINOIS, U.S.A.

Consider the HUMAN Factor

With the introduction of women as machine operators in the War Production Program, ease of operation is as much a requisite of machine tools as accuracy, dependability, versatility and long life. Productivity of manpower or womanpower depends largely upon the amount of physical energy required. The combination of up-to-the-minute design and skilled workmanship makes the Reed-Prentice No. 4 Vertical Milling Machine ideally suited to meet the rigid requirements of today's exacting production.

The Reed-Prentice No. 4 Milling Machine, featuring centralized control, is a powerful precision machine tool that responds immediately to hand lever, wheel or pushbutton control. Operation is so positive and simplified that long training periods are unnecessary.

No. 4 VERTICAL MILLER



BRANCH OFFICES
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75 West St.
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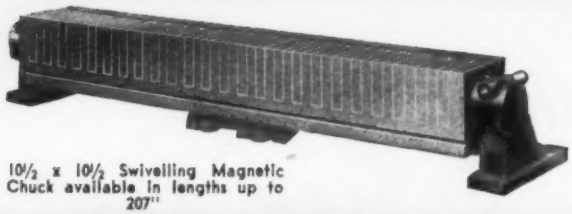
REED-PRENTICE CORP.

MAIN OFFICE
WORCESTER
MASS. U. S. A.



10½ x 10½ Swivelling Magnetic Chuck available in lengths up to 207"

No. 617 Bar Pole Face Rectangular Magnetic Chuck

Your every need can be met with

WALKER MAGNETIC CHUCKS

DEMAGNETIZERS

Send for a copy of Bulletin K7 giving complete information on Walker D.C. and A. C. Demagnetizers. These units —in 110 and 220 v.—are suitable for removing residual magnetism from a wide variety of work, are convenient and highly efficient.

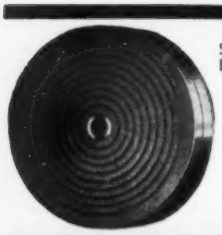
Aside from the fact that Walker Magnetic Chucks are of tried and proved design and construction, the big advantage in coming to Walker for your needs is the fact that you can be certain that you will exactly meet your needs. Regardless of your requirement, there's a Walker to handle it.

The completeness of the Walker Magnetic Chuck line makes it possible for you to standardize on these well-known and widely accepted units. Every type of magnetic chuck is available in a wide range of standard sizes including Rectangular, Swivelling, Vertical Face and Rotary. Every design is modern, convenient, with maximum uniform magnetic strength over the entire surface.

Get all the details pertaining to sizes, types and construction by wiring today for a copy of Bulletin W4.

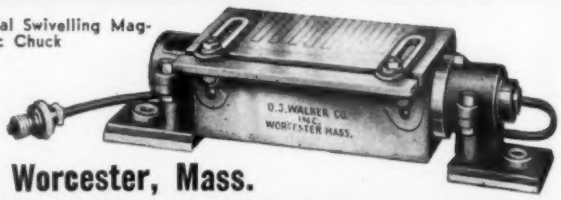
Also

Walker is prepared to furnish promptly and at reasonable price any special magnetic chuck that may be required for special service conditions. Outline your problem and ask us to submit details and quotations.



Style D Face Plate for Standard Rotary Type Chucks available in sizes up to 66" diam.

No. 410 Universal Swivelling Magnetic Chuck



O. S. WALKER CO. Inc., Worcester, Mass.

ADAMS

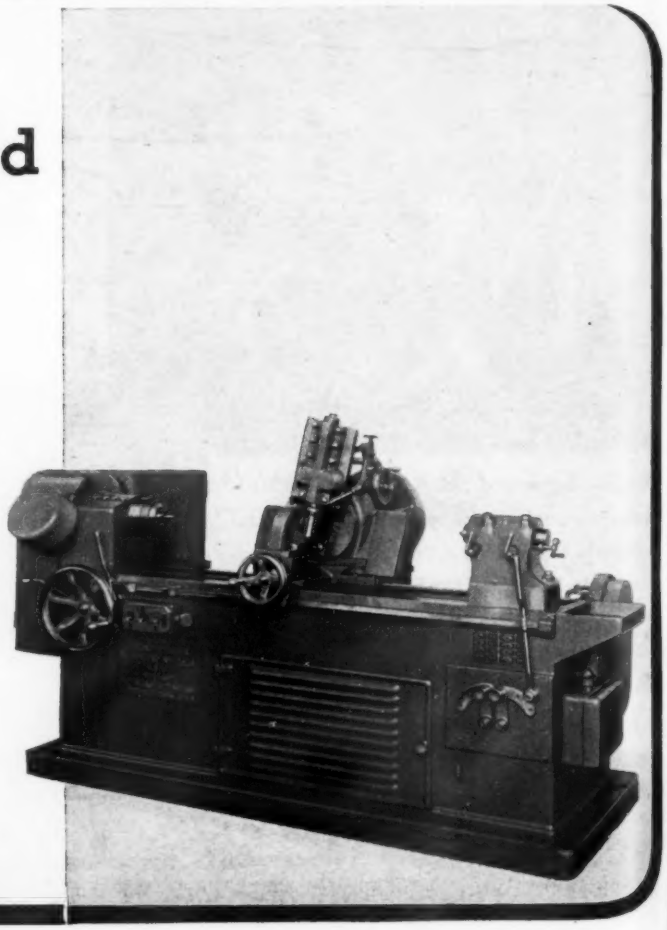
Gear Hobber and Thread Miller

Here is a versatile machine that will help you to produce precision gears on an uninterrupted schedule.

It excels in the production of multiple splined shafts, and it hobs spur gears and helical gears of any angle.

In addition, it functions as a thread miller on single or multiple threaded worms, lead and feed screws, etc.

Our catalog No. 501 contains full information. Do you want a copy?

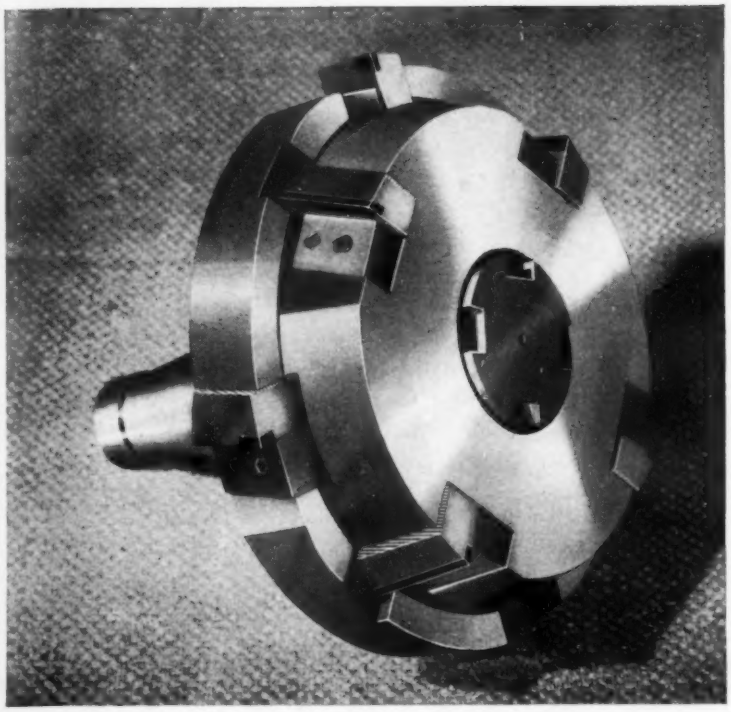


THE ADAMS COMPANY

Est. 1883

1905 Bridge St. **Dubuque, Iowa**

Aircraft Manufacturer Mills Duralumin



at

3700 RPM

with this special cemented carbide tipped cutter

•

The newest method of milling aluminum alloys calls for running the cutter faster than most grinding wheels. Such high spindle speeds greatly increase the strain on the cutter. This makes it even more important that the cutter be properly designed and made.

The two step milling cutter shown above was manufactured by Carbide Fabricators to meet the requirements of an aircraft manufacturer. It is used for milling duralumin forgings and is run at 3700 revolutions per minute. It is nine and one half inches in diameter which gives it a surface speed of 8800 feet per minute. Feed is 59.2 inches per minute. This is one of many cutters manufactured by Carbide Fabricators to meet similar demands for cemented carbide tipped tools for heavy service.

There are many places in YOUR production where specially designed cemented carbide tipped tools would mean faster production . . . greater accuracy . . . longer tool life . . . lowered cost. For details on a particular job, send a set of blueprints to Carbide Fabricators. Complete information, including prices, will be furnished promptly.

CF Carbide Fabricators ROYAL OAK MICHIGAN

DIVISION OF MORSE TOOL COMPANY • DETROIT

HIGHLY EFFICIENT IN ACTION!

NICHOLS Hand Miller

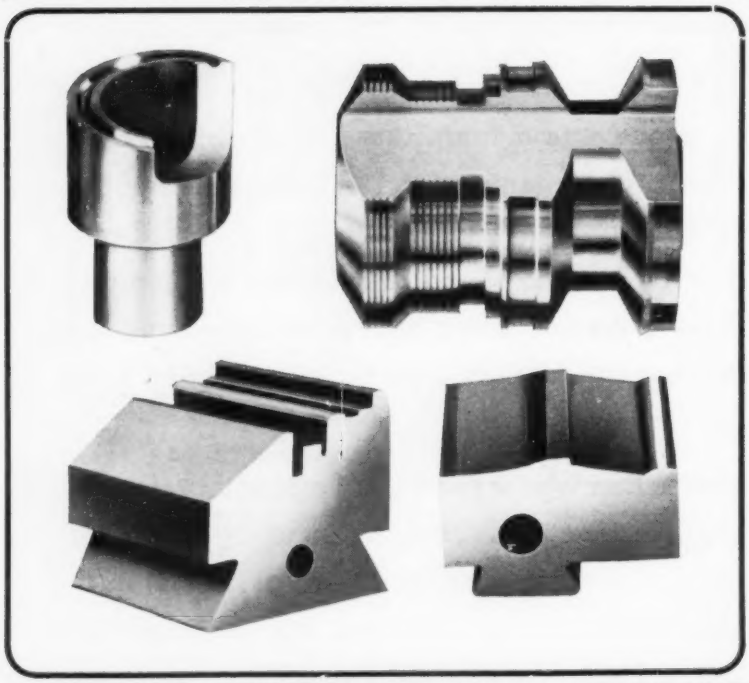
Built to keep pace with "around the clock" production, the NICHOLS HAND MILLER combines time-saving efficiency with high cutting speeds in the precision milling of small parts.

Low cost investment in the NICHOLS HAND MILLER will pay high dividends on your production line where speed with accuracy is essential.

Longitudinal Feed, 10". Transverse Feed, 7". Vertical Feed of Knee, 13½". Vertical movement of Head, 4½". Micrometer dials on Transverse and Vertical Feeds. Spindle Speeds:—100, 200, 600 and 1200 r. p. m.

W. H. NICHOLS & SONS

WALTHAM, MASS., U. S. A.



WELDON FORM TOOLS

● Ground Flat and Circular Form Tools of intricate Shapes —held to extremely close tolerances include some of the important WELDON contributions to ordnance requirements of both World War I and World War II. Proper selection of material for the tool—correct design—facilities to produce accurate, long life form tools are customer obligations amply met by WELDON.

THE WELDON TOOL CO. Cleveland, Ohio

HIGH PRODUCTION THAT SPEEDS WINNING

PRECISION is the "secret weapon" that flies "into the blue horizon" with the fighting lads who man American-made planes.

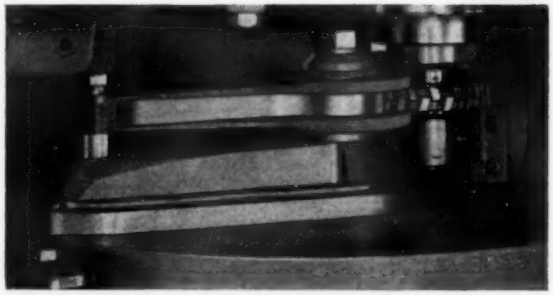
In America's aircraft plants and other metal-working industries, high speed automatic machinery specially designed and built by Davis & Thompson, has advanced new standards of precision and speed . . . higher precision parts, in greater numbers, are being made faster than ever before in history.

Fortified by many years of pre-war experience, Davis & Thompson engineers are boosting production by creating multiple-spindle boring, drilling, milling machines and other high speed precision units . . . rugged, compact, hydraulically operated, fully automatic machines to meet specific requirements.

Write for copy of the book,
"VICTORY PRODUCTION"

DAVIS & THOMPSON COMPANY
Milwaukee, Wisconsin, U. S. A.

BUY MORE U. S. WAR BONDS!



The machine shown here, for instance, automatically completes approximately 20 steps in the process of rough and finish-milling on aircraft engine connecting rods, on a single setup, with unvarying precision and speed that cuts production time down to a fraction of former methods. This uniform accuracy simplifies final inspection, precludes rejections, saves vital metal and manpower. The operator merely touches the proper control buttons on this hydraulically operated machine and ultra-automatic devices activate the complete operating cycle.

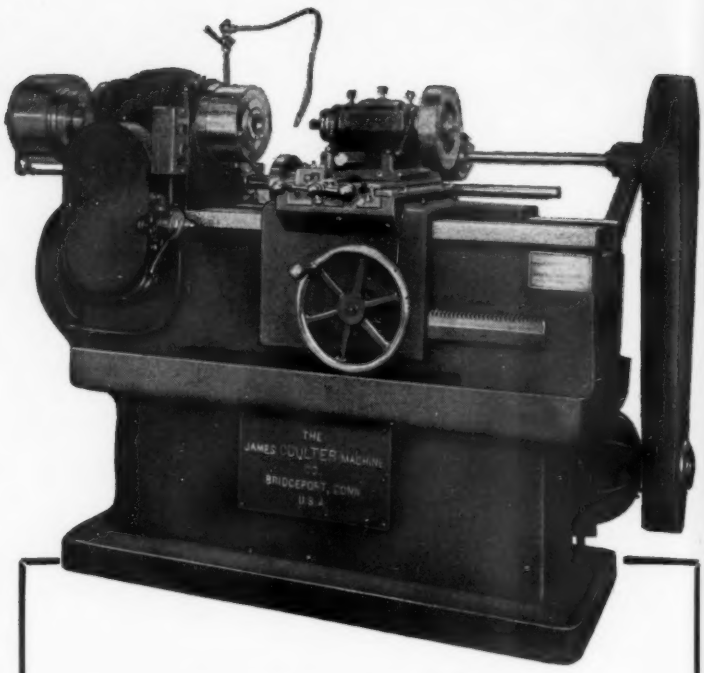
D&T ROTO-MATIC HIGH PRODUCTION MACHINERY

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

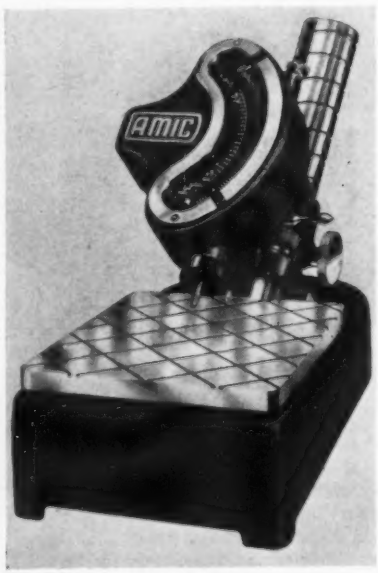
Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.

COMPARATOR WITH TILTING HEAD

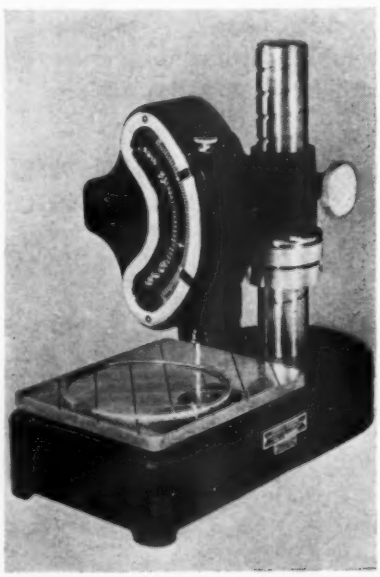


AMIC

Designed for measuring the width of piston rings, particularly of *air engine piston rings*, and larger work pieces. The piston ring is placed on the lapped, serrated 6½"x8" plate and easily measured on all points of the side faces.

←*Designed to replace flush pin gages.* The ideal instrument for measuring lengths, depths and recesses. The tilting head permits the instrument to be set at any angle for rapid, precision checking.

COMPARATOR FOR PISTON RINGS



AMERICAN MEASURING INSTRUMENTS CORP.
240 WEST 40th ST., NEW YORK, N. Y. *Phone:* PEnnsylvania 6-0687

AGAIN PERFEX DELIVERS the GOODS!

75% of standard MALE THREAD GAGES can be DELIVERED in 48 hours!

★ With the tremendous response to our advertisement last month announcing the "48-Hour Delivery" on 75 per cent of standard male thread gages, we are convinced that many manufacturers throughout the country need this type of gage. That is the reason why we repeat this offer of 48-hour delivery service.

A combination of a new plant, modern equipment and experienced workmen has made it possible for Perfex to make this offer. Yes, it is the "know how" that enables Perfex to make and keep delivery promises and it is the "know how" that enables Perfex to manufacture the finest and most accurate gages. There is a 3 to 5 week delivery promise on all other Perfex standard size gages. For a prompt quotation on our standard male thread or other standard size gages send specifications and blue prints today and we will see that a quotation is immediately forwarded to you.

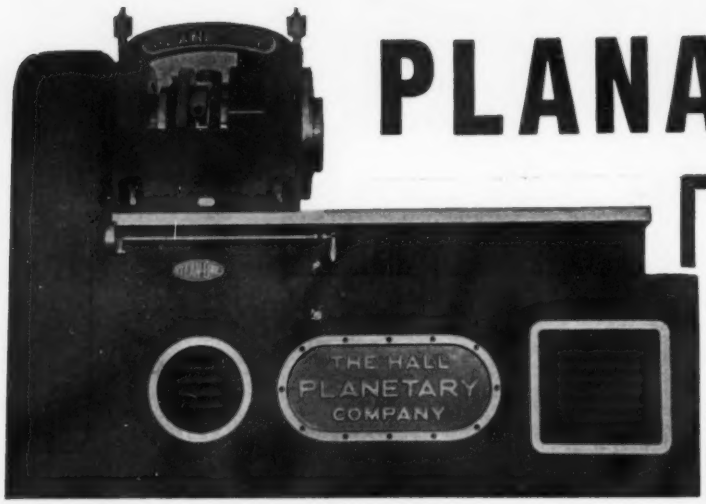
PERFEX manufactures Thread, Plug, Radius, Contour, Profile, Flush Pin, Adjustable Snap, Solid Snap, etc.

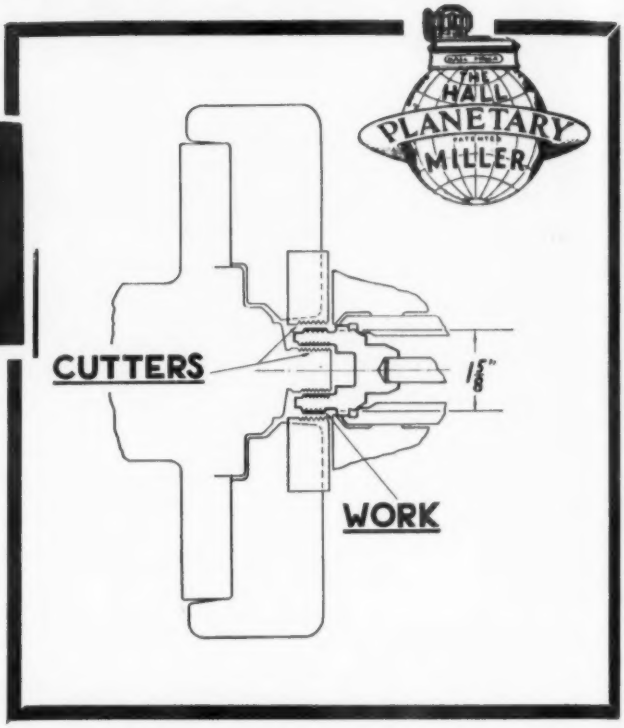
ACCURACY PERFEX OUR CREED

PERFEX GAGE and TOOL CO.

3602 GAYLORD DETROIT, MICHIGAN

PLANAMILLING





THREADS MILLED SIMULTANEOUSLY IN 45 SEC.

On the piece shown (a shell part), both threads are milled simultaneously in 45 seconds. Both of these threads are of different pitches and can be either right or left hand.

Simultaneous milling of both threads assures concentricity of both threads with each other and with the locating surfaces.

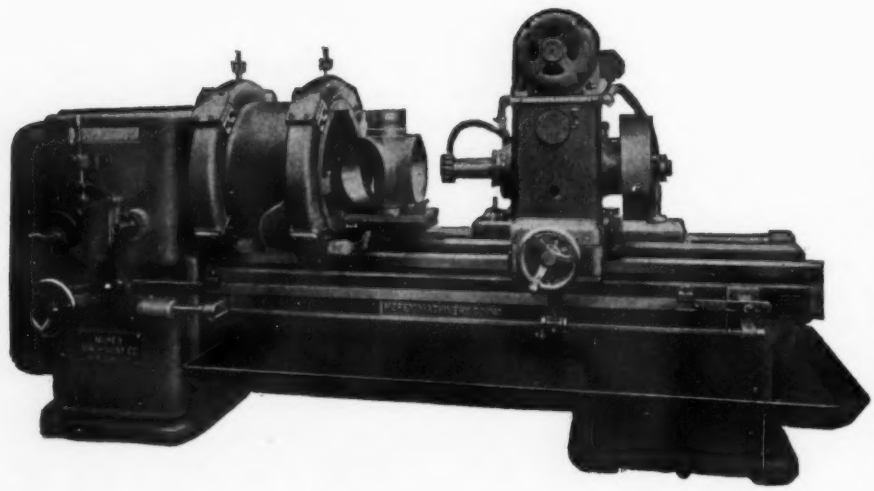
This normally difficult operation is easily handled on the PLANETARY.

Our engineers will gladly offer suggestions for speeding up your production.

The
HALL PLANETARY COMPANY
Fox St. & Abbotsford Ave.,
Philadelphia, Pa.

MOREY DESIGNED AND BUILT *For* PRECISION *Plus* PRODUCTION

MOREY-SHIELDS THREAD MILLING MACHINE



Maximum diameter	Distance between centers
12″	60″
12″	90″
12″	120″

Longer beds to order

• Hole through spindle 4 1/16″ . . . Headstock—a complete self-contained unit . . . Simplicity in selecting varying cutter speeds and feeds . . . Extra heavy and rigid bed section . . . Motor driven cutter head, fully universal . . . Control—convenient to operator . . . Equally efficient for external or internal thread milling, with either single cutter or a hob.

Ask for Circular No. 737

MOREY MACHINERY CO., INC
410 Broome Street New York, N. Y.

4 PRECISION VERNONS

They're *Simple!*
They're *Powerful!*
They're *Economical!*

Get a Vernon for extreme accuracy AT LOW COST.

VERNON
NO. 0 PRECISION
HORIZONTAL MILL

VERNON
VERTICAL MILL
AND JIG BORER

VERNON
12" PRECISION
HEAVY DUTY
BACK-GEARED
SHAPER

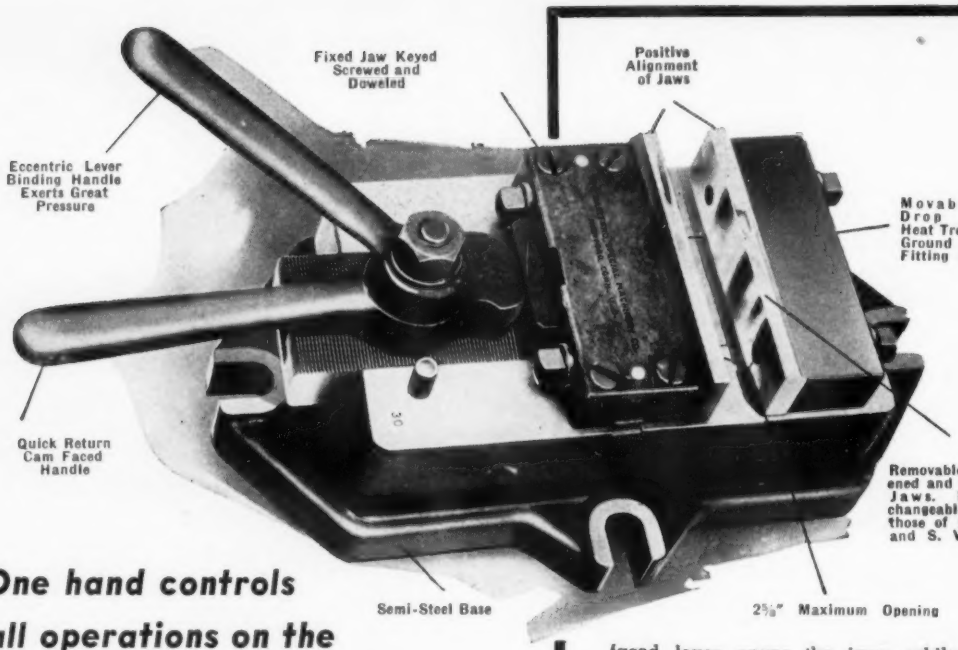
VERNON
UNIVERSAL
TOOL & CUTTER
GRINDER

Bulletins are available giving complete information on each tool.

Write for your free copy today.

MACHINERY MANUFACTURING COMPANY
1915 EAST 51 ST., VERNON -- LOS ANGELES, CALIFORNIA

Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS


Fixed Jaw Keyed Screwed and Doweled
Positive Alignment of Jaws
Eccentric Lever Binding Handle Exerts Great Pressure
Movable Jaw Drop Forged Heat Treated and Ground on all Fitting Surfaces
Quick Return Cam Faced Handle
Removable Hardened and Ground Jaws. Interchangeable with those of No. 2B and S. Vise
Semi-Steel Base
2⅝" Maximum Opening

SPECIFICATIONS

Jaw Width—5"
Jaw Depth—1 3/16"
Max. Opening (Plain Jaw)
Jaws in Place—2⅝"
Jaws Removed—3½"
Max. Opening (Swivel Jaw)
Jaws in Place—2¼"
Weight—40#
Length—13"
Width—8"
Height—5"

One hand controls all operations on the "HARTFORD" Quick Acting MILLING VISE

THE HARTFORD SPECIAL MACHINERY COMPANY
Hartford, Connecticut

Two conveniently placed levers, easily operated by one hand, provide the means of quick opening, secure holding and release. Manipulation of the lower cam faced lever opens the jaws while the upper eccentric lever transmits the tremendous gripping power for holding work. Jaws can be opened instantly for chip clearance or removal of work by merely releasing top lever and moving the lower lever a quarter turn.

The "Hartford" is adaptable to any milling job within its capacity and assures a fast and convenient way to help speed up small arms production. In spite of its great holding power, work is protected against marring.

FULL DETAILS ON REQUEST

DOUGLAS MILLER
FOR SMALL PARTS PRODUCTION

PROMPT DELIVERY

DOUGLAS MACHINERY CO., INC.
150 BROADWAY · · NEW YORK, N. Y.

DIE HEADS Self-Opening **TAPS** Collapsible

THREADING MACHINES

MURCHEY MACHINE & TOOL CO.
951 Porter St. Detroit, Mich.

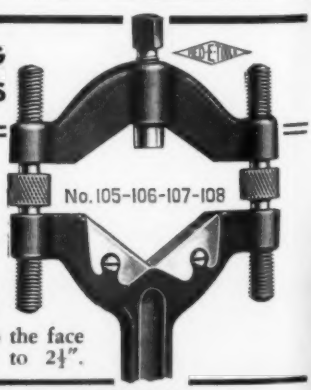
HOLMAN
BETTER, FASTER HOLE FINISHING

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.

BALANCED GRINDER DOG *for* **CUTTER GRINDERS**



EASILY ADJUSTED

Convenient and handy and can be used for a number of sizes. Can be used close up to the face plate. Two sizes cover ¼" to 2½".

THE READY TOOL COMPANY
IRANISTAN & R. R. AVES. BRIDGEPORT, CONN.

LIBERTY

48"x48" Double Housing
MEDIUM DUTY PLANER

• This new Liberty incorporates many modern features of design and construction that make for accuracy, efficiency and economy on medium class planer work.

For Example: Double Length bed.

Pressure lubricated Vees.

Box type table with "T" slots machined from the solid.

Extra heavy box type housings, bolted and doweled to bed.

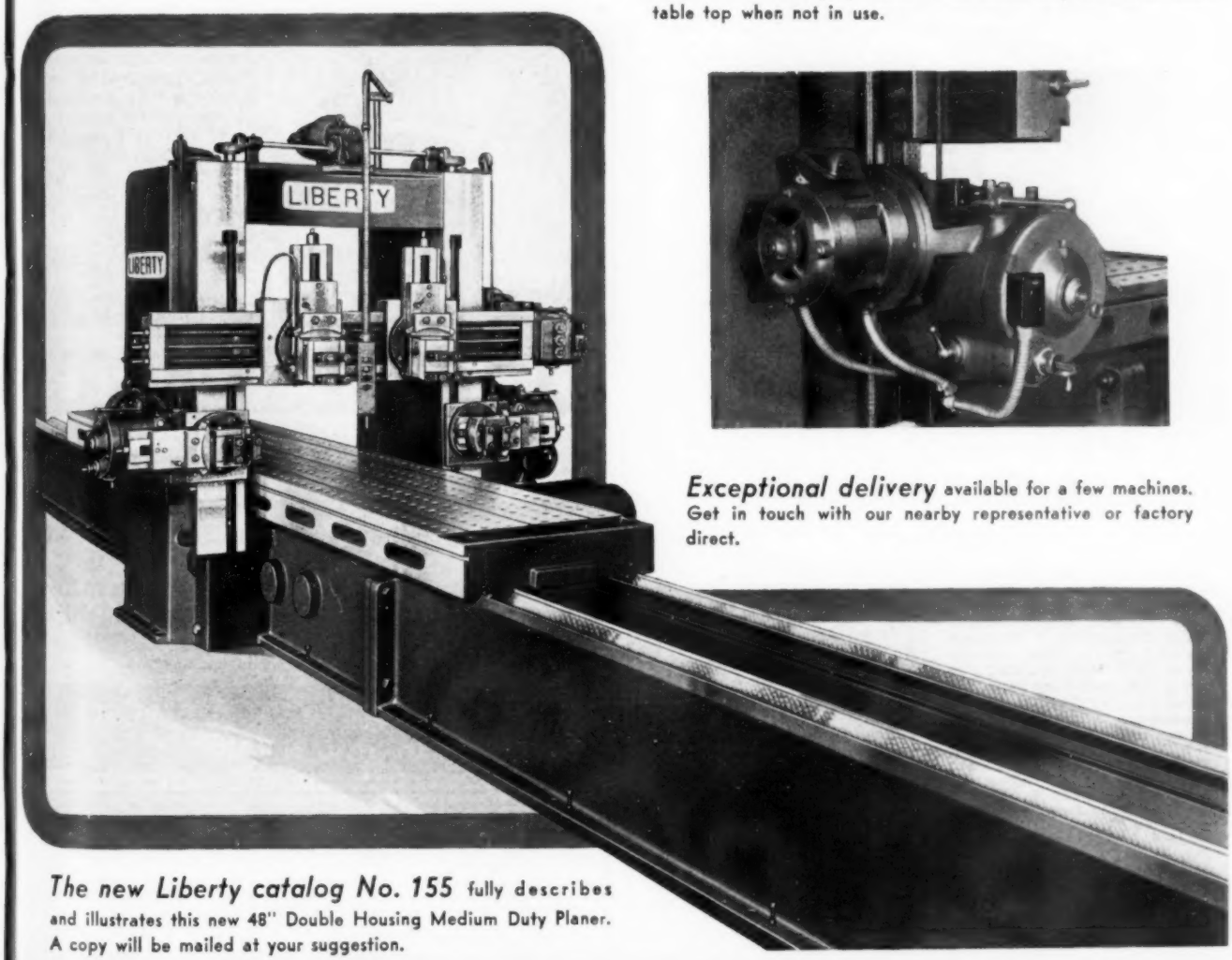
Sturdy cross brace at top for sustained rigidity.

Deep box type cross rails individually motorized for elevating.

Friction feed and rapid traversing mechanisms for rail heads are immersed in oil and located at end of rail along with simplified control.

Rail heads are equipped with automatic pneumatic tool lifters.

Note close up of heavily constructed counter-balanced side head. Individual motor for feed and rapid traverse up or down. Simple control easily operated. Side heads may be moved below table top when not in use.



Exceptional delivery available for a few machines. Get in touch with our nearby representative or factory direct.

The new Liberty catalog No. 155 fully describes and illustrates this new 48" Double Housing Medium Duty Planer. A copy will be mailed at your suggestion.

LIBERTY PLANERS

1006 WELLER AVENUE HAMILTON • OHIO

The Book of the YEAR!

VICTORY SCREW THREAD
DATA BOOK
With
Foreign and Domestic
THREAD SYSTEMS

CONTENTS

Definitions • Thread Series • Fits (Description) • Marking Symbols • Stockable Chaser Sizes • Coarse Thread Series—Basic Dimensions • Proposed National Extra Fine Thread Series • 27 Pitch Lighting Fixture and Brass Tubing Threads • Fine Thread Series—Basic Dimensions • Tolerances for Screws and Nuts Class 2 and 3 • 8, 12 and 16 Pitch Series • Class 2 Tolerances for Coarse and Fine Thread Series for Screws and Tapped Holes • Tap Drill Sizes for National Coarse and Fine Threads • American National Pipe Threads—Straight Pipe Threads • Acme Threads • Stub Acme • SAE Fuel, Oil and Tube Fitting Thread • Stub 60° Thread • Spark Plug Thread Sizes. British Standard Whitworth • British Standard Fine Thread • British Association Thread • Cycle Engineers Institute Thread • British Standard Pipe—Taper and Straight • International Metric Thread • French Standard Metric Thread • French Standard Thread • Lowenherz Thread—Decimal Inch Equivalent of Millimeters • Equivalent of Metric Pitches in Inches and Threads Per Inch • Three Wire System of Measuring Threads • Decimal Equivalents • Single and Double Depths of American National Whitworth and V Threads Compared • Cutting Speeds—Surface Feet • Weight of Bar Stock Per Foot • Guide for the Design and Purchase of Screw Machine Products • SAE Steels (Analysis) • Important Suggestions on the Design of Threaded Parts.

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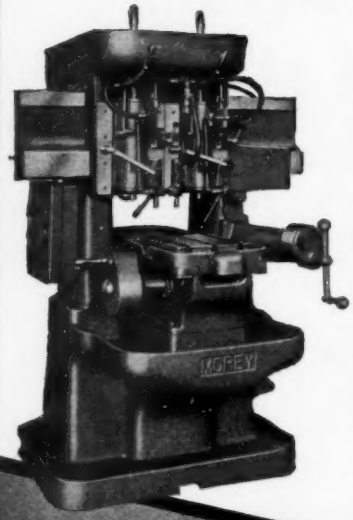

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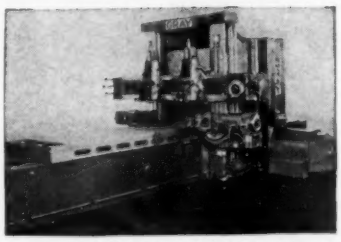

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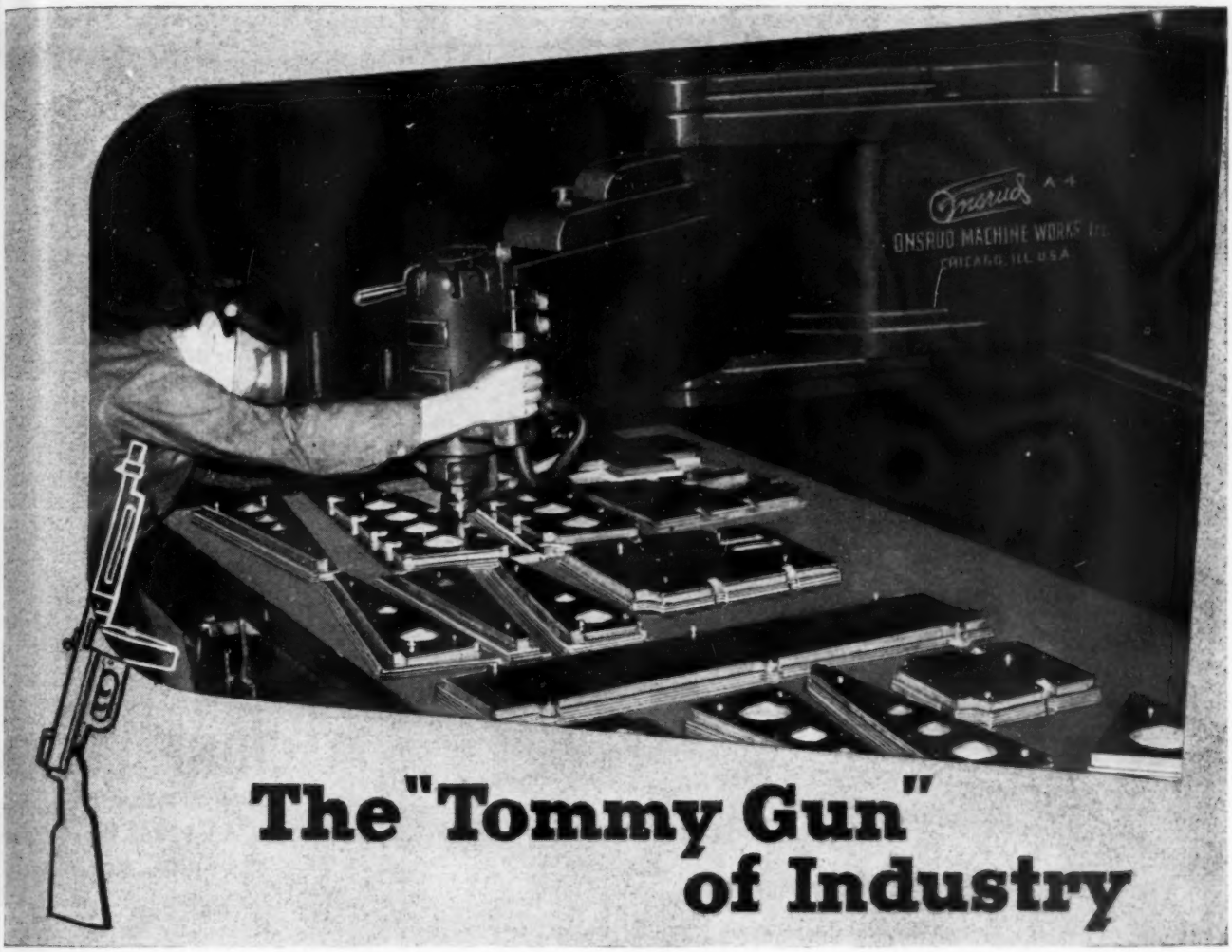

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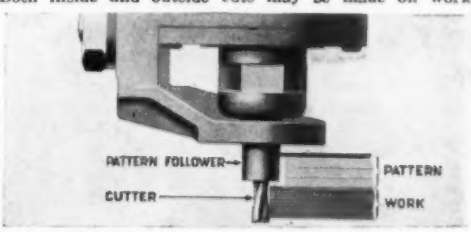

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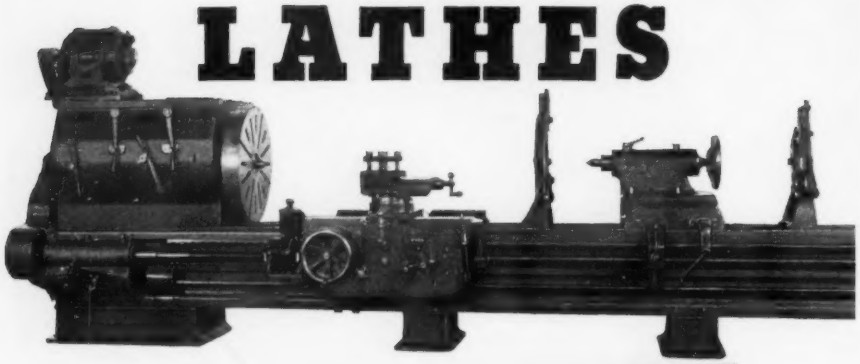

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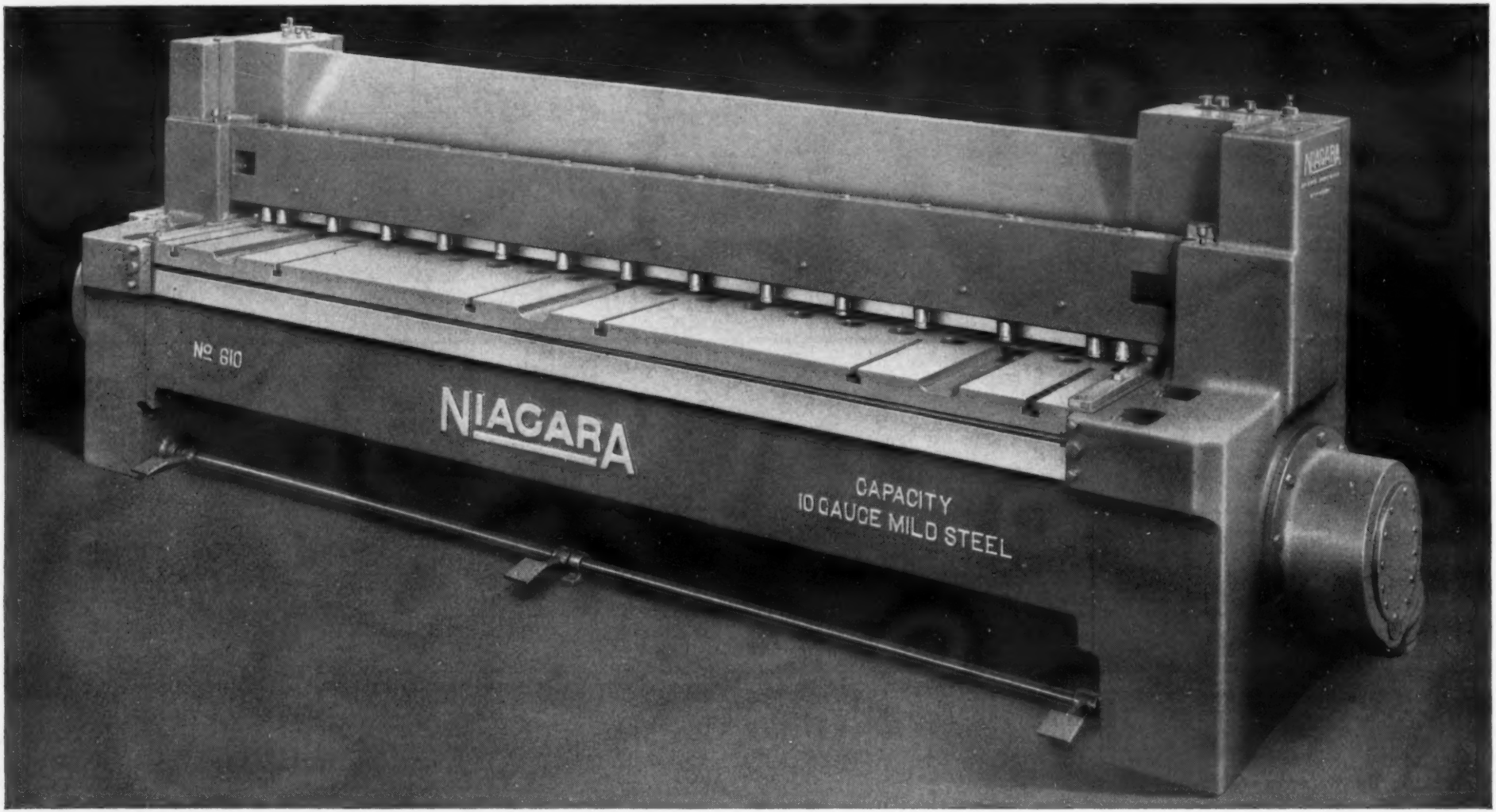

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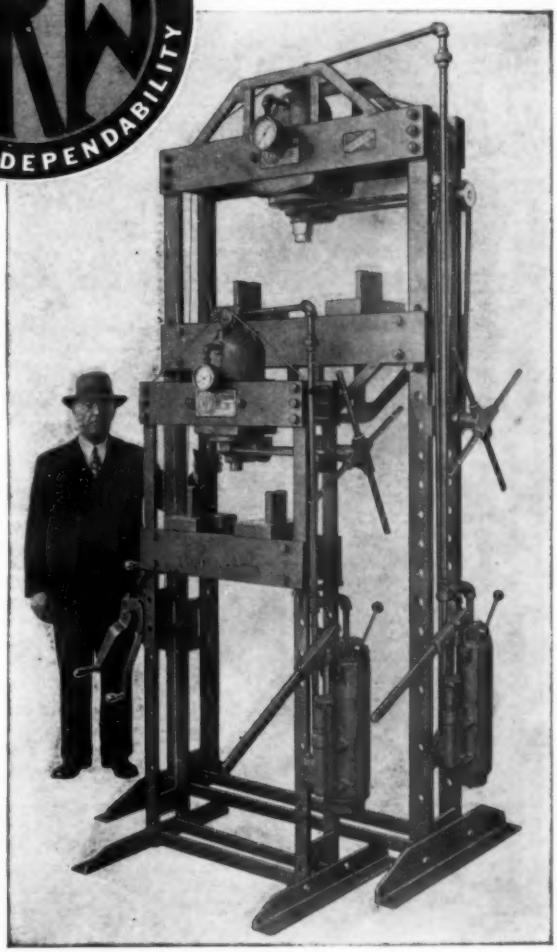

With standard KRW Hydraulic Arbor Presses as a work-proven basis, we have been able to speedily design and build many special presses for war production—without time-consuming engineering delays. The net result has been a greatly accelerated production of vital equipment which is helping to speed the day of Victory.

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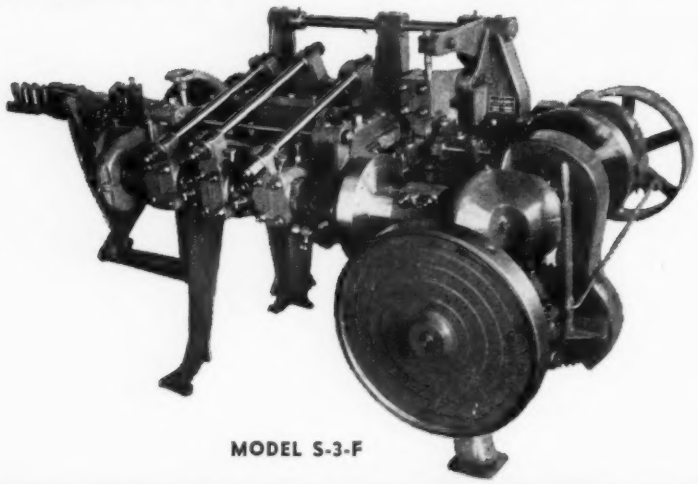

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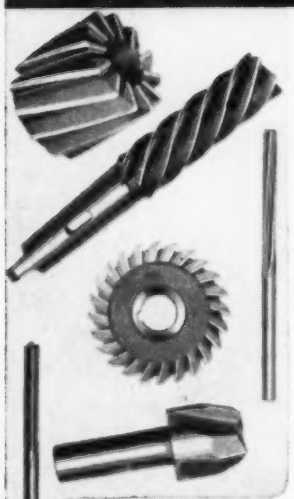

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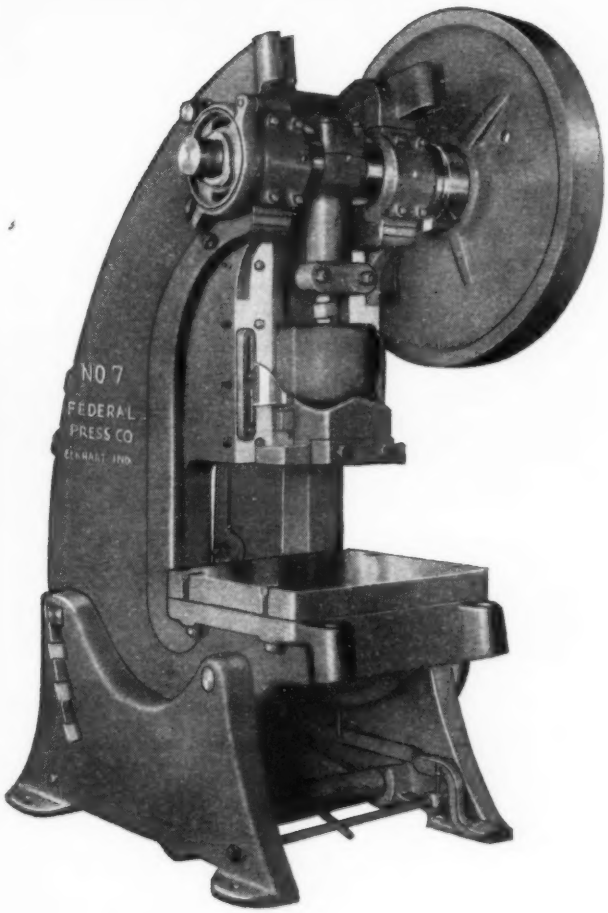

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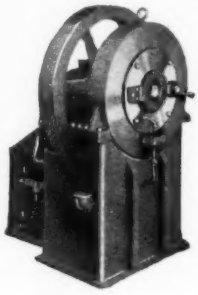

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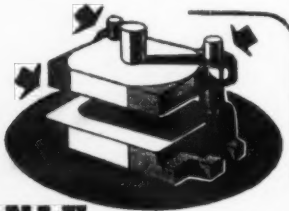

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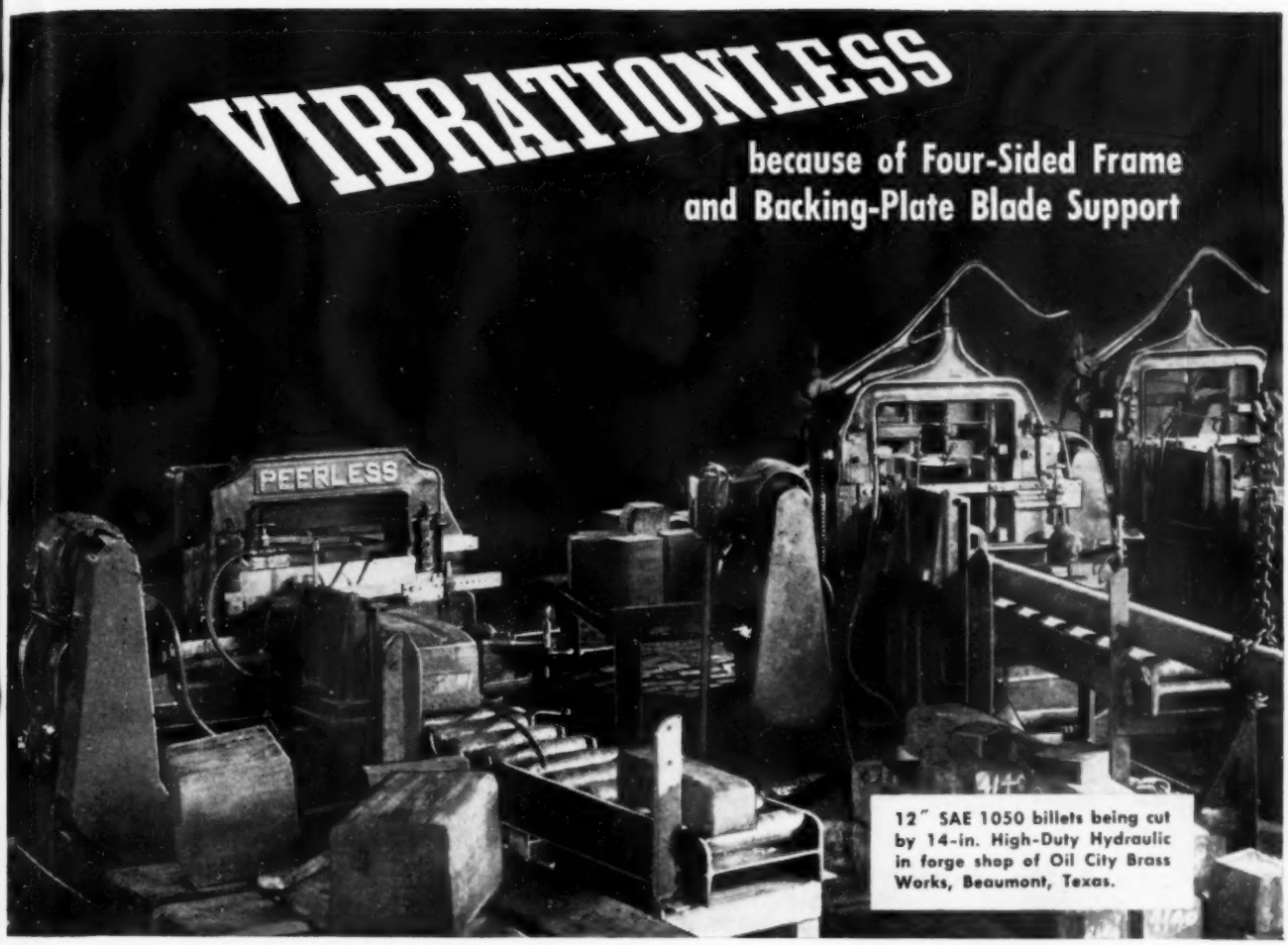

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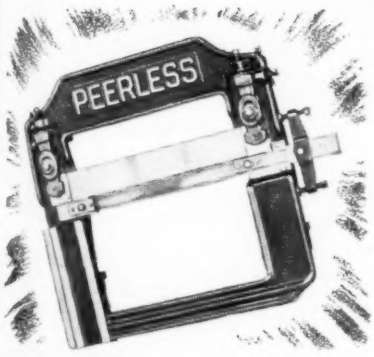

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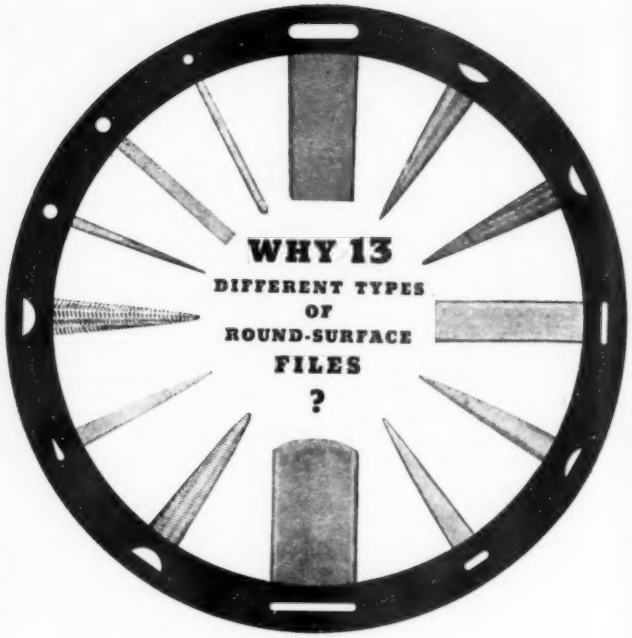

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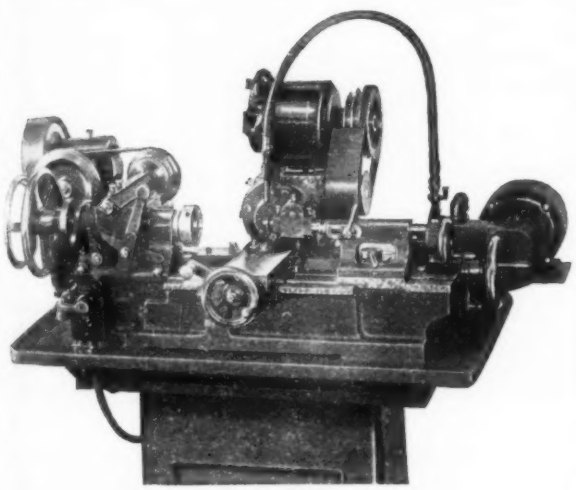

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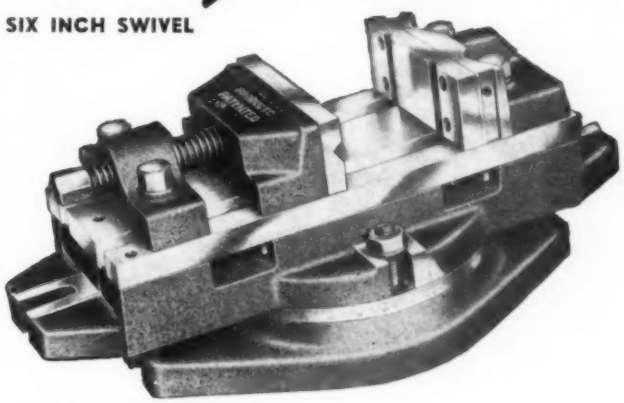

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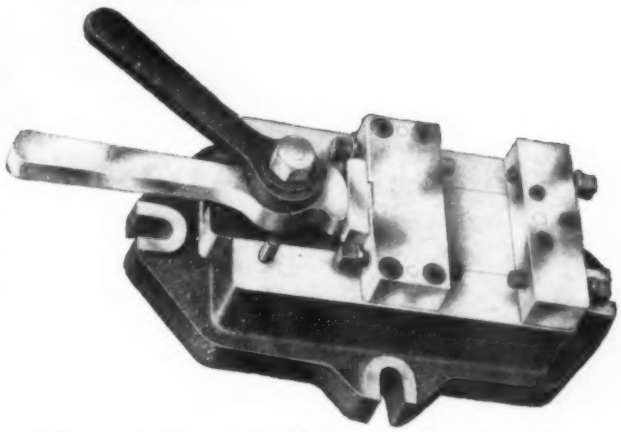

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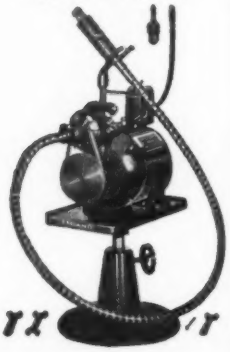

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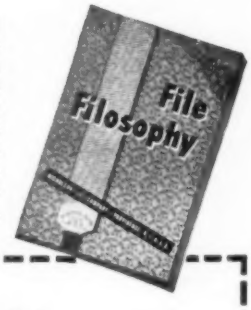

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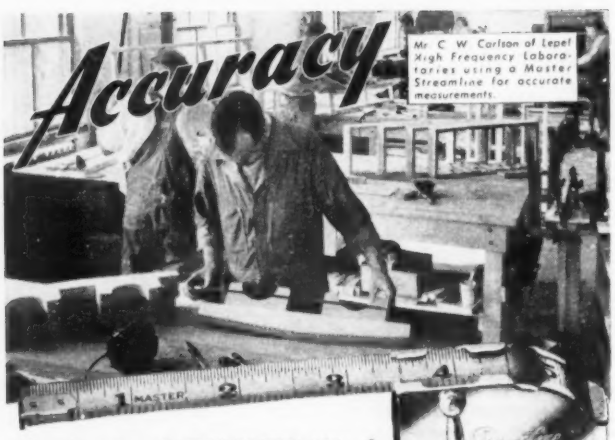

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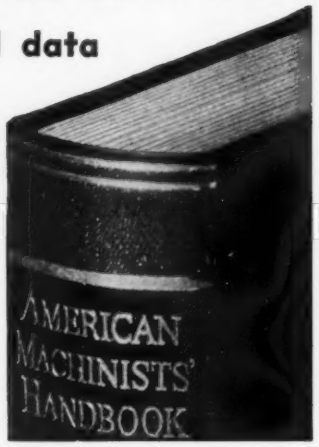

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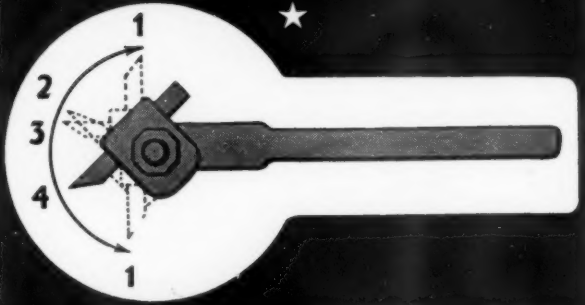

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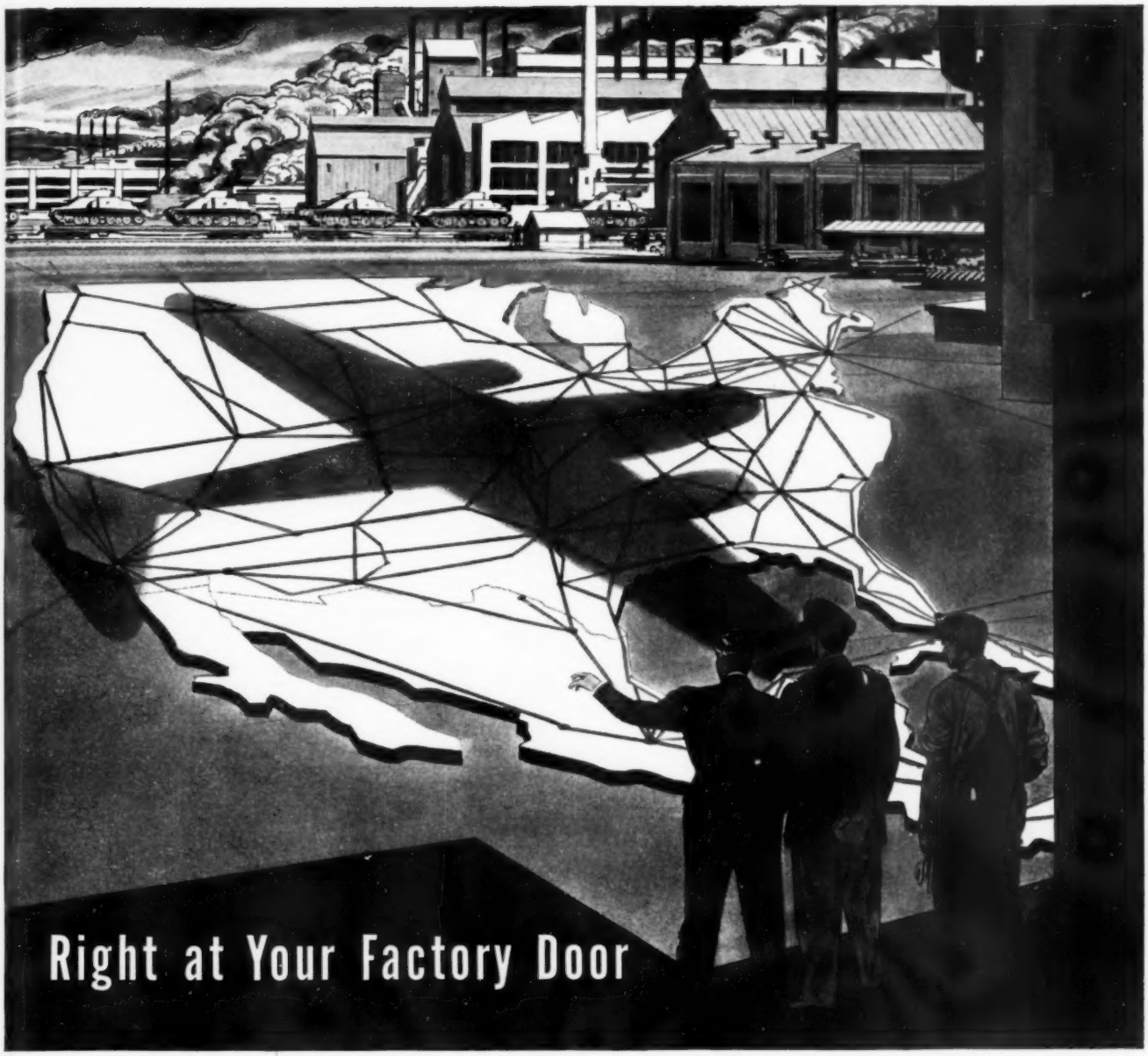

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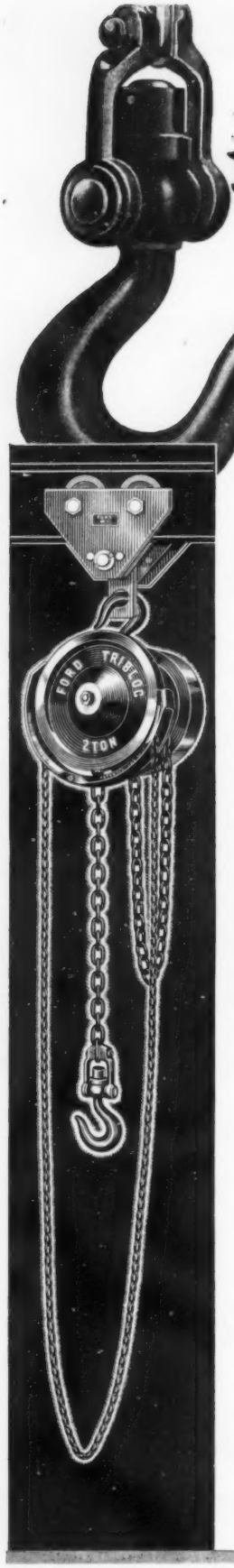

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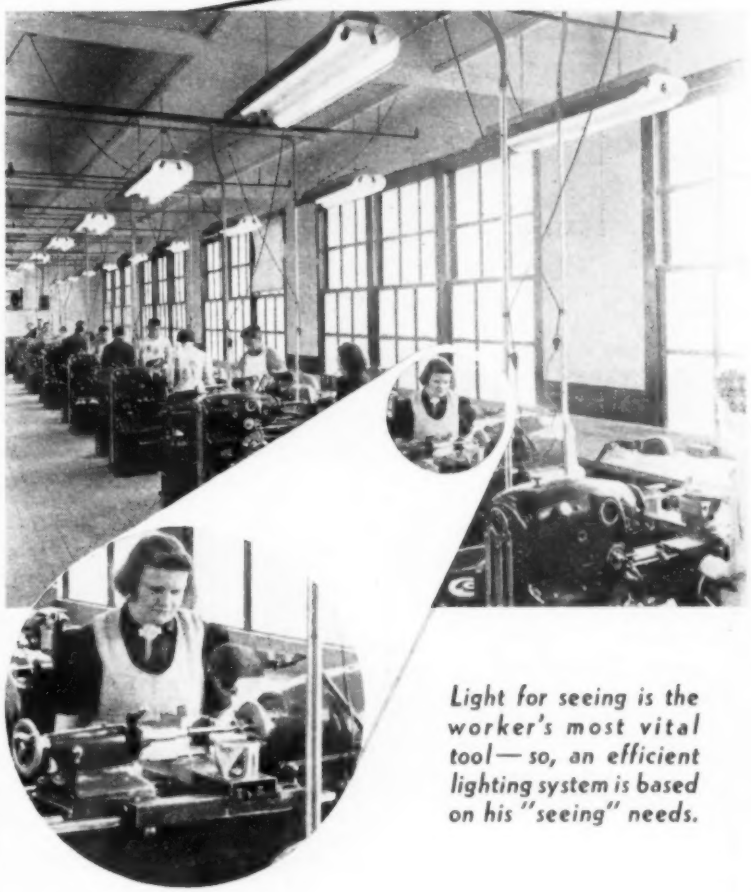

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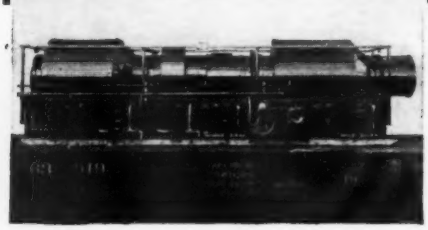

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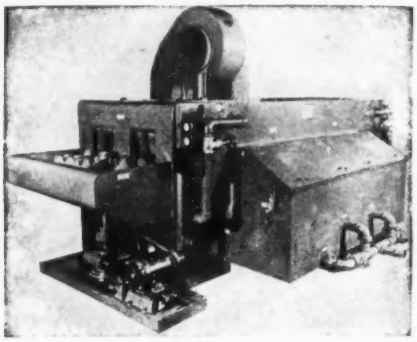

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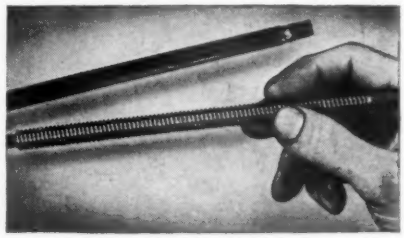
Advertisement

PRECISION PARTS

PUTTING SOME VERY SPECIAL SCREWS TO HITLER

Like most of the precision work that Ace men and women are now machining and grinding with an accuracy that makes paper seem mattress-thick, this jackscrew has an unmentionable part in war aviation. Let's just say it helps add many miles per hour to fighter planes.



Double lead, close tolerance.

But that needn't keep us from telling you that it is over six inches long and that its thread tolerance is "plus 0, –.0005"." And if you study it carefully you'll see that it has a dual lead—two threads parallel with each other.

There's only one way to get accuracy like that into thousands of Acme threads. You have to grind the threads, and if you have to grind them in quantity you'll be wise to send them to Ace. For Ace knows production-grinding, and can perform tricks of Centerless, Thread, and Surface Grinding that are imperative in wartime and will be equally imperative to your post-war product. Our Thread-Grinding department is now at capacity, but for all other metal parts which combine accuracy and volume, have an Ace up your sleeve. We will welcome samples or sketches.

Capacity open except in threads.

ACE

ACE MANUFACTURING CORPORATION

for Precision Parts

1207 E. ERIE AVENUE, PHILADELPHIA

SEARCHLIGHT SECTION

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

MECHANICAL DRAFTSMAN capable of designing and developing Power Industrial Truck Equipment. Permanent position with opportunity for advancement. Must be over 38 years of age and able to take charge of drawing room. P-546, American Machinist, 330 W. 42nd St., New York, N. Y.

WANTED—By leading Machine Tool Builder man for advertising department. Please furnish full particulars regarding your experience together with salary expected. P-553, American Machinist, 330 W. 42nd St., New York, N. Y.

SALES ENGINEER with machine tool experience, preferably in screw machine line, by old line manufacturer. P-557, American Machinist, 330 W. 42nd St., New York, N. Y.

WANTED: A competent machine shop general foreman by plant located in an industrial city in East Tennessee and doing general jobbing and building special machinery. Plant operates own foundry, machine shop, and pattern shop. Offers splendid opportunity for rapid advancement. None but a man of highest qualifications need apply. P-558, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

WANTED: First class engineer experienced in machine tool design; practical experience desired. For man who can assume responsibility this is a good opportunity now and after war with leading machine tool builder. P-559, American Machinist, 330 W. 42nd St., New York, N. Y.

WANTED: First class practical machine tool designer by leading machine tool builder. This is good opportunity now and after war for man who can assume responsibility. P-560, American Machinist, 330 W. 42nd St., New York, N. Y.

WANTED: Draftsman, machine shop inspectors, methods engineers. If not on war work now, apply to: Economy Pumps, Inc., Liberty Planers, Hamilton, Ohio.

PLANT MANAGER: To take complete charge of plant operations of large Conveyor Manufacturer in middle west. Must be familiar with machine shop and foundry operations and be able to install efficiency methods for reduction of shop costs. Right man can have permanent connections and will receive official recognition. College man preferred. If interested advise previous experience, when available, and starting salary. P-565, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS — This advertising service of 33 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 266 Delward Bldg. Buffalo, N. Y.

Executives, Engineers, Chemists and Metallurgists!

Qualified men wanted for openings throughout the United States. Write for application, or submit experience record.
Inquiries solicited from responsible employers.
All negotiations confidential. Est. 28 yrs.

HARRISON PERSONNEL SERVICE
20 W. Jackson Blvd. CHICAGO

Professional Services

BRIGGS-EVANS
Engineering Consultants
Specialists in Design & Methods
High Production
Dies, Tools, Jigs, Special Machines
We know how best to do
what you would like to do
60 STATE ST., BOSTON, MASS.

WANTED

Mechanical Engineer
for Forge Plant and machine shop

Assistant Works Manager
for Forge Plant

Foremen
for Forge Plant

Must have thorough experience in forge plant operations. These are permanent positions with good salaries and excellent futures for capable men. Give full details of experience, education and personal data. Address:

Personnel Director

TUBE TURNS
Incorporated
224 E. Broadway
LOUISVILLE, KY.

ENGINEER!

HAVE YOU GOT WHAT IT TAKES?

to tackle a tough supervisory job in a modern toolroom located in the New York area and engaged in manufacturing gages, jigs, fixtures and precision parts. The job is no bed of roses: the task is exacting, the hours unlimited. But the rewards are commensurate with the achievement.

The requirements are actual toolroom and production experience in making the above products plus a proven ability for handling men. Can you add the men to the machines and produce a result?

Write to us. We'll read your story carefully and in confidence. Naturally, if you are employed at your highest skill in war work do not apply.

P-567. American Machinist
330 West 42nd St., New York City

MACHINE SHOP FOREMAN

Must Have A1 Experience

Must be able to set up milling machines, lathes, screw machines, plan and lay out work. This includes supervising shop of thirty-five men.

STEADY WORK
$7,500 YEAR
Location — Manhattan
ONLY U. S. CITIZENS
not engaged at full skill in war work.
WRITE, GIVING ALL DETAILS

P-564, American Machinist
330 W. 42nd St., New York City

POSITIONS WANTED

EXECUTIVE—technical graduate. Thirty-five years experience in product design, tools, production and sales. Can provide designs for volume product for post war business. Soon at liberty. PW-556, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

COMPETENT AMERICAN engineer with broad experience in product design and production engineering for low costs and high production. Age 57. Salary $8,000. Can organize, supervise, and train others. PW-561, American Machinist, 330 W. 42nd St., New York, N. Y.

MECHANICAL EXECUTIVE with excellent background and reputation as Works Manager, Chief Engineer, Plant Superintendent, Tool and Machine Designer, and Tool and Die Maker. My forty years experience will be available May 1st to a progressive company, making definite plans for Post-War activities. Moderate Salary with Profit Sharing arrangements will be considered. Location Metropolitan New York or Lower New England States. References exchanged. PW-562, American Machinist, 330 W. 42nd St., New York, N. Y.

REPRESENTATIVE AVAILABLE

MECHANICAL ENGINEER now selling tool bits, can represent manufacturer of Milling Cutters, Reamers, or machine shop equipment. RA-566, American Machinist, 330 W. 42nd St., New York, N. Y.

SALESMAN WANTED

MECHANICAL ENGINEER for a manufacturer of precision gears. Must have long selling experience in the same line. Write full details outlining educational background, names and addresses of former employers, territory covered. Exceptional opportunity for well qualified man. SW-539, American Machinist, 330 W. 42nd St., New York, N. Y.

WANTED

LINES WANTED BY Engineering Sales Organization. Established sales company, main office in Chicago with large engineering sales staff, highly organized specialty department, and unusual record in selling to industry, wants lines such as tools, accessories, measuring instruments, welding devices, handling equipment, etc., for distribution in Northern Illinois, Northern Indiana, Wisconsin, and Iowa. Especially equipped to distribute products requiring individual emphasis. W-563, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

PATENT ATTORNEYS

PATENTS, COPYRIGHTS. Booklet, "General Information Concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington, D. C.

CONTRACT WORK

WORK WANTED — For advertisements of work wanted see page 312.

THE NICHOLS TABLE OF SCREW THREADS AND TAP DRILLS
$1.75
Now is the time to order your copy. One table, 60 PAGES long, listing all standard screw threads with essential thread data.
THE NICHOLS CO. 1213-K ST. S.W., CEDAR RAPIDS, IOWA

WANTED
1—4'0" to 5'0" **Vertical Boring Mill,** motor driven.
1—4'0" **Planer** with an 8'0" to 12'0" travel, motor driven.
1—No. 2 Size **Milling Machine,** or a table size of about 18" Wide x 6'0" Long, with a (4) way feed, motor driven.

W-550, American Machinist
330 W. 42nd St., New York, N. Y.

WANTED
LATHE
14" x 6' bed American
all geared head engine Lathe complete with motor and controls and accessories. Must be in good condition and not over 5 years old.

ELDRIDGE W. BURFORD
4401 Venable Ave. S.E. Charleston, W. Va.

NEW INVENTIONS WANTED
Mechanical and electrical devices which can be used to promote our war production program. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

CONTRACT WORK

ESSEX
MACHINE WORKS
ESSEX, CONN.

•

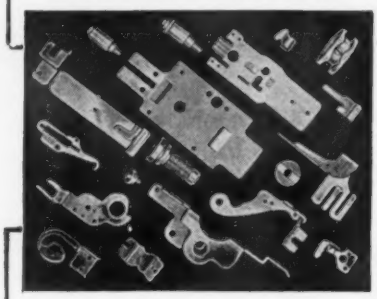
Contract Manufacturing and Industrial Machine Work

•

Producing For War
Planning For Peace

STAMPINGS AND ASSEMBLIES

Fast Service on Long or Short Runs



"GREATER SAVINGS WITH GREIST"

We can handle your stamping and assembly requirements in any metal. Our modern equipment and methods coupled with 50 years of experience is your guarantee of accuracy and efficiency. Our facilities include capacity for handling screw machine products, tools, dies, jigs and fixtures.

Quality work by skilled mechanics is assured. Send your blueprints or samples today for prompt quotations!

THE GREIST MFG. CO.
546 BLAKE ST. NEW HAVEN, CONN.

SPECIAL ENGINEERING WORK

ON A CONTRACT BASIS . . .
exactly to your specifications . . .

A complete and efficient service for the manufacture of machines and parts, special tools and fixtures, etc., is available to you in our modern, fully-equipped shop. We also offer cam milling facilities that will fit your requirements. You are guaranteed quality work at a reasonable cost.

Send your blueprints or samples today for prompt quotations at no obligation.

Designers and builders of wire and ribbon stock forming machines.

THE A. H. NILSON MACHINE CO., Bridgeport, Conn.

KIRK & BLUM

CONTRACT MANUFACTURING
ACCURATE SHEET STEEL
STAINLESS STEEL, MONEL OR
OTHER ALLOY FABRICATION
OUR SPECIALTY
CAPACITY 3/8" AND LIGHTER

THE KIRK & BLUM MFG. CO.
2823 SPRING GROVE AVE. CINCINNATI, OHIO

DESIGN & BUILD
JIGS, FIXTURES & GAGES

REED MACHINE & TOOL ENG.
BOX 662
PAWTUCKET, R. I.

WIRE AND METAL SPECIALTIES
In round, flat, square and special shaped wire in all metals.

LARGE PRODUCTION CAPACITY
Plating and finishing.

EASTERN TOOL & MFG. CO.
BLOOMFIELD, N. J.

SUB-CONTRACT FACILITIES FOR

Hand screw machine products.
Engine and bench lathe, milling the drill press work.
Small sheet metal fabrications to closer than commercial tolerances.
Stampings.

We do our own tooling

RELIANCE MACHINE & MFG. CO.
Thirty Irving Place New York City
36 years experience in metal fabrication

QUALITY

SCREW MACHINE PRODUCTS

•••

WALTHAM
SCREW COMPANY
WALTHAM • MASS.

MACHINE SHOP WANTS DEFENSE WORK

Lathes, Milling Machines, Drill Presses, Riveting, Hot Dip Tinning, Jigs and Fixtures. Investigate TODAY.

STEPHEN J. LEWIS ENGINEERING CO.
215 Butler St. Triangle 5-5348 Brooklyn, N. Y.

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us — we will take care of them.

GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

METAL STAMPINGS

• TOOLS • DIES •

PERMANENT MAGNETS
HEAT TREATING

THOMAS & SKINNER
STEEL PRODUCTS CO.
1103 E. 23rd St. INDIANAPOLIS, IND.

Gray Iron and Semi Steel Castings, also alloyed with nickel, chrome, and molybdenum. Wood, Iron, Brass and Aluminum pattern work.

KING FOUNDRIES, INC.
Phone 823 North Wales, Montg. Co., Pa.
22 Miles from Philadelphia, Pennsylvania

COMMERCIAL HEAT TREATING
Seasoning of Steel, Nitriding
Centerless, Broach, Thread Grinding
Magnaflux & Optical Testing
Metallurgical & Chemical Laboratories
Cadmium & Hard Chrome Plating
ENGINEERING DIVISION

AGERSTRAND CORPORATION
Muskegon, Michigan

MACHINE SHOP

Facilities include 9" South Bend Bench Lathe, #2 Brown & Sharpe Milling Machine, Drill Press and 8"x8" Shaper. The usual line of hand tools and equipment plus experienced workmanship assure your satisfaction. Your inquiries invited.

C. VANDEGRIFT CO. HOCKESSIN, DELA.

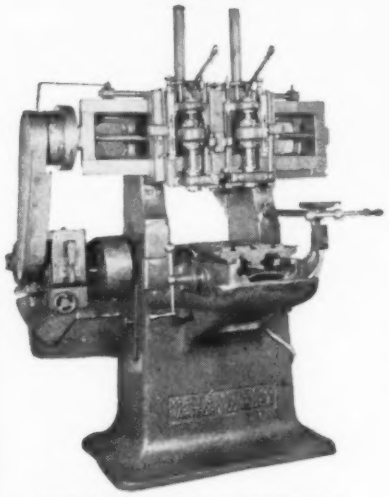
PRODUCTION SURFACE GRINDING

AUSTIN P. CULLON
TOOL & ENGINEERING
2926 Biddle Ave. Wyandotte, Mich.

WAREHOUSE STOCK

"FALK" for DEPENDABILITY in Rebuilt Machinery

PROFILER



Pratt & Whitney #12 two spindle motorized profiler. Table 12"x15" equipped with 6" raising blocks, and 5 H. P. 3 ph. 60 cy. 220 V. motor—Turner drive mounted and wired to push bottom control—Rebuilt and guaranteed

MILLING MACHINES

P & W Duplex Miller #2
Becker #7 Lincoln Production Miller
Sanford #1½ Production Miller, Rotary Table
Cleveland Vertical Miller #1—(New)
Index Universal Vertical Millers (New)
No. 1 Brown & Sharpe Univ. Plain Milling Mach.
No. 1½ American Universal Milling Machine.
1—No. 2 Owens Plain Horizontal Milling Machine.
1—Gooley & Edlund Production Miller Type A.

GEAR CUTTERS

No. 1 ADAMS FARWELL Gear Hobber; complete.
No. 2 WHITON SPUR GEAR CUTTER, Auto.
1—No. 3 Barber Colman.

SHAPERS & SLOTTERS

24" Cincinnati Triple Geared Shaper, Fric. Dr.
20" Steptoe Back Geared Crank Shaper Cone Drive.
20"x20"x24" N-B-P SHAPER-PLANER, arr. M.D.

24" Bullard Rapid Production, M.D.
30" Coburn Vertical Turret Mill, M.D.
3½" Rochester Floor Type Horiz. Boring Mill, M.D.

RADIAL DRILLS

1—Niles, Bement-Pond, flat column 5' arm.
Niles Bement-Pond, flat column 6' arm.

COILING MACHINES

No. 1 and No. 2 SLEEPER & HARTLEY BX CABLE COILING MACHINES ⅜ and ½" cap. Last used for Speedometer cable. Complete.

PUNCH, SHEARS & BRAKES

1—Long & Allstatter Combination Punch & Shear, 1¼" thru 1"—36" throat on punch end, 24" throat on shear end.
WICKES COMBINATION PUNCH AND SHEAR, MOTOR DRIVEN; 1¼" thru 1" Plate; Punching end 48" throat; Shearing end 36" throat; Continuous 6"x1" Plate.
Niagara No. 135 Deep Throat Punch Shear, Hydraulic Wheel Press. 200-tons, 42" between strain bars. Self-contained, belt rive.
Niagara 36" foot Shear, 16 ga.
Kutscheid all steel 36"x16 ga. Foot Shear.
Pittsburgh 36"x3/16" Plate Shear, no holddown.
No. 236 PEXTO CIRCLE SHEAR, SPD; 16 ga.
No. 132 BLISS 14 ga., 12" throat, Slitter.
No. 232 BLISS 12 ga., 18" throat, Slitter.
No. 96C Toledo; Twin Geared, Double Geared, Tie Rod Double Crank, Single Acting Power Press, Bed Area 72"x51".
No. 941½J Toledo Double Crank, Double Geared Twin Drive, Motor Driven Straight Side, Tie Rod Power Press, Bed Area 120"x50".
Toledo 93½J 125 Ton Power Press, Bed Area 95x34, Single Acting, 6" stroke. Double Geared Tie Rods.
Bliss No. 1 125 Ton Power Press, Bed Area 64"x37", Sinkle Acting, 4" stroke.
No. 18, 18C, 19, 19C, Bliss, OBI.
No. 19 Truesdale OBI. Same as 19C.
No. 4 Adriance OBI.
No. 4C
No. 4 MICHIGAN OBI.
No. 6 Waterbury Backed Geared, Open Back.
No. 2 BLISS Back Flywheel Plain, (6).
No. 1—Bliss Back Flywheel Plain.
No. 15N BLISS, arr. Geared, Motor dr. (2).
No. 25N BLISS Geared, Motor dr.; (3).
No. 1 BLISS S.S. Toggle Press.
No. 103S BLISS GANG DIE PRESS; Roll Feed.
3-ton General Flexible Press.
36" NIAGARA 16-gauge Power Squaring Shear, Like New.
No. 30 BLISS ARCH PRESS, Plain.
No. 25 NIAGARA ARCH PRESS, Plain.
No. 71 Waterbury Coining Press, 25 Tons.
No. 93D TOLEDO DBLE. CRANK GEARED S.S. PRESS, Welded Frame.
No. 75 Toledo Open Back Plain Flywheel Press.
No. 2 Niagara OBI.
No. 3 American Can Co. OBI.
1—Niagara Combination Brake and Folder 6'x10 gauge, motor drive.

GRINDERS

14" Pratt & Whitney Vertical Surface Grinder.
No. 6 Besley Double Opposed Disc Grinder.
No. 2 & No. 3 Brown & Sharpe Cutter Grinder.
Taft-Pierce Automatic Pin Grinder.
Gardner No. 4 Disc Grinder Duble End, 20" disc, 16" ring wheel, ball bearing belt drive.
Badger No. 2 Double End Disc Grinder 16" disc, ball bearing spindle. Universal table.
1—Gisholt Drill Grinder.
Badger No. 2—16" Disc. Dbl. End. Univ. Tbls., Belt.
Gardner No. 1—double end Disc, 12", B.B. belt dr.
Gorton, double end disc grinder, 18" discs.
Sellers drill grinder.
#1 Le Blond tool and cutter grinder.

INTERNAL GRINDER

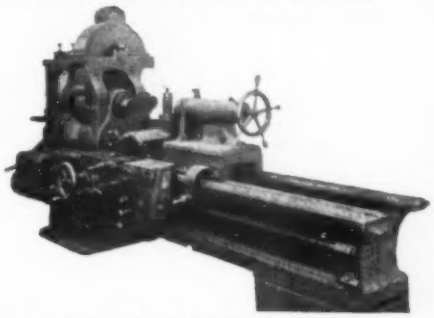
GREENFIELD No. 12, HYDRAULIC FEED, Motor Drive; Cap. swings 15"; Grinds automatically ¾" to 5" dia.: 4" Deep; New in 1928.

TURRET LATHES

1¼" Gridley "F" 4 spindle Automatic Screw Machine, Milholland Geared Head Hand Screw Machine 1½" cap. Arranged motor drive, now equipped as Milholland Lassiter Staybolt Machine.
Jones & Lamson 3 x 36", Double Spindle, Motor Driven with Air Truck equipment.

LATHES

20 x 10' Mueller Lathe Q.C.G. Taper Attachment, Chuck, Double Back Geared.
30"x12' Putnam Quick Change Gear Screw Cutting Engine Lathe, Arranged Motor Drive.
18x10' Reed Plain Change Lathe.
18"x12' Hamilton Plain Change Lathe.
18x6 South Bend Plain Change Lathe.
16x6 South Bend Plain Change Lathe.
1—13 x 6 Seneca Falls Quick Change Gear Lathe.



30" x 12' Putnam Quick Change Gear Lathe.
19" x 24" New Logan lathes, with collets, etc.
Lodge & Shipley 26-28" x 21' bed, 14' 6" Centers, Taper Attachment, Pan Bed with Oil Pump.

DRILLING MACHINES

MULTIPLE SPINDLE DRILLS

1—15 H Fox Hydraulic 35 spindles, #1 M.T., Motor Drive.
1—D-31 Fox, drilled for 32 spindles, fitted with 16, #2 M.T., rectangular head 17 x 34, power feed, elevating table motor drive.
1—No. 217 Baker, #5 M.T.
1—No. 3 Leland-Gifford 24", 2-spindle with power feed, #3 M.T.
3—Cannedy Otto Upright Drills.

TRIMMERS

2—Waterbury-Farrell Automatic Trimmers ⅝ cap.

THREAD MILLERS

Hall Planetary No. 2—24" Swing.
Lees-Bradner No. 8—12"x54.
Pratt & Whitney 6x14.

THREADING MACHINES

1½" Acme Single Head Bolt Threader, like new.
Acme ⅝" Double Head.
Acme 3" Single Head.
Landis 1½" Single Head Bolt Threading Machine.
National 2" Double Head, Geared M. Dr.
Williams 6" Pipe Threading Machine.
Merrill 10" Pipe, Motor Drive with motor.
Curtis Portable 4" Pipe Threading Machine.
Williams 2" Pipe Threading Machine.
Jarecki 2" Pipe Threading Machine.

AUTOMATIC CHUCKING MACHINES

1—No. 24 New Britain type 4 spindle, 5 chucking stations.
1—No. 23 New Britain type 4 spindle, 5 chucking stations.
1—Jones & Lamson Hartness Automatic Chucking Lathe Motor Driven 12" diam., 6" face, 6" width cap.
1—Brown & Sharpe #0 Cutoff, Serial 5563.

Buy From Stock

MACHINERY

Tel. Main 6347

FALK

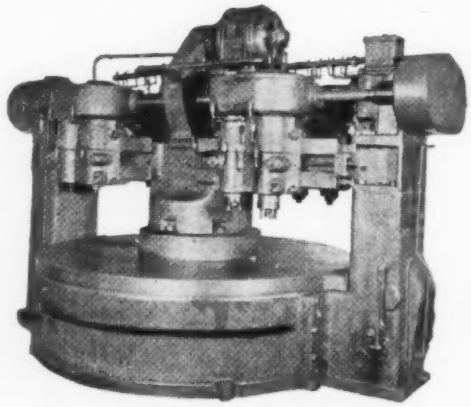
MACHINERY CO.,

18 WARD ST.

MERCHANTS

ROCHESTER, N. Y.

NEWTON ROTARY MILL from stock



V-4 NEWTON CONTINUOUS MILL

Emerman offers this mill available for quick delivery from stock. This double station continuous miller is especially suited for large work such as milling tops and bottoms of cylinder blocks, cylinder head gasket surfaces, heavy motor frames and similar work.

With 2 double heads on front of rail and 2 double heads on rear rail

Table diameter 106".
Table working width 33".
Horizontal adjustment of each head on rail 19".
Diameter of spindle sleeves 6⅝.
Vertical adjustment of each spindle 4".
Maximum distance between front and rear heads 42".
Maximum distance from spindle to face of table 21⅝".
Arranged for motor drive.

LOUIS E. EMERMAN & CO.
machinery

875 W. 120th St. Chicago, Ill.

USED and REBUILT MACHINERY FOR SALE

LATHES

Lathe & Morse, M.D. 26" x 12'
Pittsburgh, Q.C. M.D. 26" x 10'
Monarch, M.D. 20" x 16'
Rahn & Larmon, M.D. 18" x 36" x 8'
Lodge & Shipley, M.D. 16" x 10'
Hendy, M.D. 14" x 6'

MILLERS

Pratt & Whitney, Table 6 x 32"
#3 Garvin Duplex, Table 12 x 64"
4" Bickford Horiz. Boring Mill, S.P.
2" Binsee Horiz. Boring Mill

GRINDERS

Modern, Cylindrical, 16 x 60 M.D.
Crocker-Wheeler, Disc Grinder
#3 Van Norman Relio, Cylindrical, M.D.
Diamond Surface, 12 x 14 x 54" M.D.
Diamond Surface, 16 x 16 x 56" M.D.
Cincinnati Tool & Cutter #1
Storm, M.D.

PLANERS

Cincinnati, 42 x 42 x 12' 2 Heads, M.D.

AUTOMATICS

National Acme, #53, 4 Sp. 1"
National Acme, #55, 4 Sp. M.D. 1⅝"
Gridley, Model G, 4 Sp. 1¼"
Gridley, Single Sp. 2¼"
Gridley, 4 Sp. 2¼" M.D.
New Britain, M.D. 6 Sp. 1⅝"

TURRET LATHES

Gisholt, 21", 2¼" thru spindle
Gisholt, 5¾" thru spindle
#3 Pratt & Whitney, 2¼" Cap.
#6 Brown & Sharpe, 2" Cap.
Bullard Vert. 24"
American Fox Monitor
#4 Acme
#4 Warner & Swasey
Pratt & Whitney, 1½"
2 #3 Foster

DRILL PRESSES & RADIAL DRILLS

Gould & Eberhardt, 24" Sliding Head
Foote Burt, Heavy Duty, 2" Cap. S.P.D.
Leland & Gifford, 4 Sp. Power feed to Sp.
Allen, 3 Sp.
Allen, 4 Sp.
6' Niles Radial Drill, Round Col. M.D.

SHAPERS

10" G & E M.D.
14" Whipp
16" Whipp
18" Robur
24" Rockford, M.D.

GEAR CUTTERS

G.E. 3 x 36" Spur
G.E. 36"

ALSO

Niagara Power Press #66-E
Niagara Squaring Power Shear 14 Gauge
Niagara Sheet Metal Shear
#17 Williams & White Heavy Duty Punch, M.D. 36" throat
Form Rolling Machines, (3 sets of form rollers)
Thompson Spot Welder, 50 KVA Air Operated
10" x 12" Newton Slotters
George J. Ohl Power Shear, 10' 14 Gauge
Radiac Cutoff
Atkins & Racine Hacksaws
Oster Threader
Standard 2" Bolt Cutter
Schatz Angle Shear
#3 Garvin Profiler

Send Us Your list of Idle Machinery We will put it to War Work

S. & S. MACHINERY CO.

207 CENTRE STREET Phone: WOrth 4-5710 NEW YORK, N. Y.

SIZES AVAILABLE

10x36
10x50
10x72
14x36
14x50
14x72
14x96
16x50
16x72
18x96

●

We can now Modernize and Motor a limited number of your NORTON Grinders.

MICRO-FINISH WITHIN PRECISION LIMITS WITH STANDARD GRAIN WHEELS

assured by

HILL-CLARKE *Modernized Motor Driven* CYLINDRICAL GRINDERS

Refinements incorporated by Hill-Clarke in these machines assure precision, minimum vibration and a finish which requires no extra grinding time. Even when using standard grain free-cutting wheels, these machines can be depended on for super-grinding and micro-finish.

Among the modern features offered in these machines to insure performance which meets today's exacting demands are the following Hill-Clarke developments.

. . . Multiple V-belt drive from constant speed motor to work head.

. . . an accurately fitted wheel slide having a ball bearing mounted feed screw—a refinement which assures sensitive wheel control and makes possible the duplication of work to extremely close limits.

. . . sheaves and motors dynamically balanced to insure smooth, vibrationless performance.

. . . mounting of coolant pump on a separate multiple compartment settling tank as a further means of eliminating vibration.

Other details of design and refinements are fully covered in illustrated bulletin "Super Grinding"—available promptly on request.

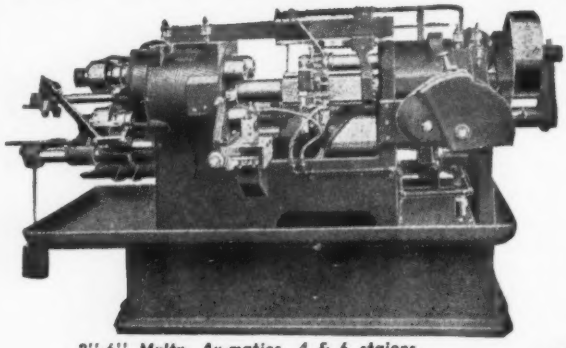
HILL-CLARKE MACHINERY CO CHICAGO U.S.A.

HILL-CLARKE MACHINERY CO.

649 WASHINGTON BOULEVARD **CHICAGO, ILL.**

PHONE: HAYMARKET 7660 CABLE ADDRESS "REMAND"

AVAILABLE PROMPT SHIPMENT



8"-6" Multx- Au-matics, 4 & 6 staions

AUTOMATIC SCREW MACHINES

6 Spindle New Britain, 1⅝" x 7" M.D.
4" National Acme 4 Spindle—Model B 2¼" Gridley, 4 Spindle, B.D.
2½" 4 Spindle Cone, B-D. ⅞" 4 Spindle Cone, B.D.
No. 652 New Britain Automatic Chucker, 6 Spindles.
No. 55 National Acme; 1⅝" cap.; 2" Cleveland; ¾" Gridley, 4 Sp.

TURRET LATHES

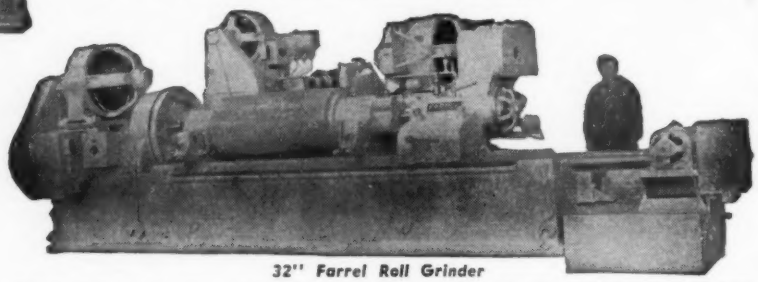
No. 3-A Warner & Swasey Universal, Motor Drive.
28" Pond; 4¼" spindle; No. 6 Brown & Sharpe Hand Screw Machine.
No. 16 Gisholt Simplimatic Production Lathes.

VERTICAL BORING MILLS

16 Ft. Niles, 2 heads on rail.
10 Ft. Pond, 2 heads on rail.
72" Colburn, 56" Niles, 51" Bullard.
52" Niles, 2 heads on rail.
48" Rockford, 3 spindles.

MILLS

No. 2½ B K & T and No. 2 B & S Verticals.
No. 2 Brown & Sharpe Universal (2)
Nos. 2 & 3 Cincinnati Plain.
24" & 18" Cincinnati Automatic, M.D.
10" Pratt & Whitney Semi-Auto.
No. 45 Productomatic; No. E-3 Keller Die Sinker.
No. 3 Lees-Bradner Thread Miller.



32" Farrel Roll Grinder

Grinds rolls up to max. of 34" dia.; 30" Grinding Wheel; 10'6" bet. centers; Motors and Controls.

GEAR MACHINERY

No. 36-BT G & E Turret Bevel Gear Rougher.
No. 6-A Cincinnati Gear Cutter 72" x 20".
No. 12 Barber Colman Gear Hobbers.

OTHER GRINDERS

15" x 15" x 96" Norton Surface.
Cylindrical: 14" x 72" Norton; 10" x 36" Landis; No. 22 Landis.
Disc: No. 24 Gardner Vertical Spindle Horizontal, B.B.; 53" disc, B.D.

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BORING MILLS—10' Betts Heavy Duty, 108" table, M.D.; 72" Betts, M.D.

RADIAL DRILLS—6' Cinci. Bickford Pl. Gear box; 5' N.B.P. Univ. Gear Box; 4½ Morris Pl. Gear Box.

CHUCKER—#34 New Britain.

GRINDERS—30" x 240" Landis Cyl. 24" Bridgeport Disc D.C., M.D. 24" x 96" Landis Cyl. 20" x 96" Landis Cyl.; 14" x 96" Cinci. M.D.; 12" x 96" Landis; 12" x 120" Landis; #6 Landis Internal.

GEAR CUTTERS—11" & 6" Gleason Bevel Gear Generators; 36" G & E Spur and Bevel; 30" Newark Spur, new 1928; 36" x 10" Cinci. Spur.

KEYSEATERS—#6 Catlin 40" stroke x 5" wide; #6 M. & M. 31" stroke x 3½" wide.

PLANERS—48" x 48" x 16' Cinci., 4 hds., M.D.; 36" x 36" x 12' Putnam, 3 hds., M.D.; 27" x 6' Woodward Powell, M.D.

LATHES—18" x 6' Greaves Klusman Grd. Hd.; 32" x 12' Pittsburgh, Q.C.G. blocks to 44"; 36" x 16' Bridgeford Grd. Hd., T.A. 36"/60" x 15' Harrington Gap; 64" x 28' New Haven.

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7" Baird 6 spindle
6"x6¾" Goss & DeLeeuw
4½" Gridley model H
1⅝" National Acme No. 55
14" Fay
No. 6A Potter & Johnston
1" Cleveland Model J
No. 16 Gisholt Simplimatic

GEAR MACHINERY

No. 16 HS Gould & Eberhardt hobber
No. 12 Barber Colman hobber
No. 1 Lees Bradner hobber
26"x8" Brown & Sharpe automatic
24"x12" Flather automatic
36"x6" Gould & Eberhardt automatic
48" Brown & Sharpe automatic
60" No 5A Cincinnati automatic
18" Gleason testers & lappers
15" Gleason spiral gear roughers
15" Gleason spiral pinion roughers
18" Gleason bevel gear generator
2 spindle Lipe chamferer
Pratt & Whitney worm grinder
National gear checker

LATHES

28" Steinle, 8" hole
24" Gisholt, 6½" hole
24" Steinle, 6¼" hole
22" Libby, 4½" hole
2¼x24 & 3"x36" Jones & Lamson
No. 1 ⅝" capacity hand screw
Nos. 4 & 5 Foster
13"x6' Automatic threading
Melling crankshaft 6 cylinder
3¼"x36" & 4"x36" Lo Swing lathes
27"x14' Bridgeford heavy turning or axle 2 carriage
8" Sundstrand stub
9" Sundstrand Mfg.
1"x18" Pratt & Whitney automatic
14"x6' Lodge & Shipley with turret on carriage
22"x24" American with turret slide

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10x36 10x50 and 14x50 Norton
12x36 12x52 16x48 and 16x60 Landis
Capitol internal
Nos. 6 & 15A Bryant internal
20"x50" Safety surface
Nos. 50 & 60 Heald cylinder
18" 24" & 30" Gardner disc
24" No. 84 Gardner opposed disc
24" No. 221 Hanchett opposed disc
20" No. 120A Gardner opposed disc
17"x36"-48" Norton hydraulic crankshaft
Gisholt tool grinder
24" Ingersoll face milling cutter grdr.
30" Ransom elec. snagging
16" Norton snagging
No. 575 Hawes tube polisher
18" Whitney wet tool
36" No. 5TGM Bridgeport wet
Cincinnati face milling cutter grinder
Pratt & Whitney grinder for worms

MILLING MACHINES

No. 3 Turnmilling for round work
Nos. 1 & 1A Davis-& Thompson drum type duplex
48" Oesterlein tilted offset
Nos. 10 & 45 Productomatics
5" and 12" Pratt & Whitney automatics
Model AB Becker vertical
Type C Hall planetary thread miller
Taft Pierce thread miller
28" Cincinnati Duplex
3½" Beaman & Smith horizontal boring mill
36" Garvin cam & form miller

PLANERS

24"x24"x5' Gray
24"x24"x6' Woodward & Powell
29"x29"x6'3" New Haven
36"x36"x10' Betts 2 heads
36" Morton draw cut shaper

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BORING MILL 60" N.-B.-T., R.P.T., M.D.
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GEAR PLANERS, Bevel, 36" & 54" Gleson, M.D.
GRINDER, Surface, UK-500 Hanchett 24"x10' M.D.
LATHE, 36" x 29' American Grd. Hd., Q.C.G., T.A.
LATHE, Turret 34" Gisholt, 4¼" H.S., M.D.
PRESS, Dbl. Crk. 95-B Toledo, bed 55" x 54".
PRESS, Toggle No. 14 Bliss, stoke 18".
PRESS, Hydr., 1000 ton Wood, platen 42" x 9'.

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Cincinnati 30"x30"x10' Bed Planer—2 graduated swivel heads on cross rail—arranged for motor drive—with motor.
Pratt & Whitney 36"x36"x8' bed Planer—2 graduated swivel heads on cross rail arranged for motor drive—with motor
Gray 26"x26"x8' bed Planer—1 graduated swivel head on cross rail—arranged for motor drive—with motor
Flather 30"x30"x8' bed Planer—1 graduated swivel head on cross rail—B/D
Pond 36"x36"x12' bed Planer—2 graduated swivel heads on cross rail—B/D
Fitchburg 36"x36"x18' bed Planer—2 graduated swivel heads on cross rail—1 side head—B/D
Flather 36"x36"x10' bed Planer—2 graduated swivel head on cross rail—arranged for motor drive—without motor

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(2) Cochrane & Bly #66H Cold cut Saws—arranged for M/D
(1) Cochran & Bly #55 Cold cut Saw—arranged for M/D
(1) Higley Cold cut Saw—complete with 7½ HP Motor

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Ingersoll 8 station Gang Miller—2 cutting arbors on each side

BROACHING MACHINES

Knowles #2 Broaching Machine

DROPS AND PUNCHES

(2) Mossberg & Granville 400# Automatic Drops
(1) Standard Machinery Co. 800# Automatic Drop
(2) Standard Machinery Co. 200# Automatic Drops.
(2) Mossberg & Granville 100# Automatic Drops

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Dietrich & Harvey Horizontal 4" Bar Floor type Boring Mill with universal sub table—M/D

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J. J. McCabe 2-spindle 26"x42"x26' lathe—B/D
Rahn-Carpenter 26"x24' Lathe—B/D
Jones & Lamson 3"x36" Turret Lathe—14" chuck—Steel head
Jones & Lamson 3"x36" Turret Lathe—14" chuck—M/D

SCREW MACHINES

Cleveland 1-spindle 1½" capacity Automatic Screw Machine—B/D

GEAR CUTTERS

Brown & Sharpe 3-26 Automatic Gear Cutter

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Bickford 4' SPD Radial Drill
Prentice Bros. Radial Drill—B/D
Baker #220 2-spindle Drill Press—with rotary table—SPD

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Pratt & Whitney 12" Vertical Grinder—B/D
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Bryant #6 Chucking Grinder—motor driven spindle—B/D machine
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14" P&W Surface Grinder

30" x 16' N.B.P. Geared Head Engine Lathe, Quick Change Gears, 230 V.D.C. Motor.

42" PUTNAM Double End Car Wheel Lathe, M.D.

6" x 6" x 5/8" Dbl. Angle Shear

Beam Shear 20" No. 60 and smaller

60" Throat 8" x 1 1/16" Shear

54" Throat 1¾" x 1⅛" Punch

6" BILGRIM Bevel Gear Generator.

15" GLEASON Bevel Gear Generator.

No. 9 N.B.P. Vertical Miller 39" rotary table, 4" dia. spindle, M.D.

No. 10 N.B.P. Vertical Miller 42" rotary table, 5" dia. spindle, M.D.

30" x 30" x 10' NEWTON Slab Miller horizontal arbor, M.D.

24" x 24" x 10' WHITCOMB-BLAISDELL Second Belt Drive Planer.

48" x 48" x 20' PATCH Planer, 4 heads, 230 Volt D.C. Rev. Motor Drive.

60" NEWTON Portable Slotter, 230 Volt D.C. Rev. Motor Drive.

24" NEWTON Cold Saw, 7½" capacity, M.D.

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7/8" Gridley Model G, four spindle
¾" Gridley Model F, four spindle
1¼" Gridley Model F, four spindle
1¾" Gridley Model F, four spindle
No. 515 National Acme, four spindle
2½" Cleveland Model A, single spindle
5/8-7/8 Cleveland Model B single spindle

DRILLS

20" Barnes Camelback Drill & Tapper
30" Superior Upright
36" New Haven Upright
No. 15½ Foote Burt Fixed Center
No. 12 Natco Multiple Spindle
No. 37 Natco Multiple Spindle

GEAR CUTTERS

No. 3 Brown & Sharpe Automatic
No. 6 Fellows Gear Shaper
96" Gleason Gear Planer
15" Gleason Spiral Bevel Generator
No. 5A Lees-Bradner Gear Generator
No. 10 Lees-Bradner Gear Grinder
30" Rochester Gear Tooth Rounder

GRINDERS

22"x48" Pratt & Whitney Vertical Spindle Surface, Timken Bearing
30" Diamond Face, 84" Table Travel
10"x20" Landis Cylindrical hydraulic
14"x50" Norton Cylindrical
No. 60 Heald Cylinder

LATHES

No. 4 Elgin Precision Bench, c.d.
9" Sunstrand Manufacturing, g.h.
18"x8' Lodge & Shipley, c.d.
32"x12' Pittsburgh, c.d.

TURRET LATHES

No. 1 Warner & Swasey, c.d.
2A Warner & Swasey, g.h.
2B Foster, g.h.
18" Libby, g.h.
24" Steinle, g.h.
No. 4D Potter & Johnson, g.h.
No. 6A Potter & Johnson, g.h.

MILLS

No. 3 Cincinnati Vertical, motor in base
No. 3 Brown Sharpe Vertical, s.p.d.
No. 2½ K&T Milwaukee Vertical, s.p.d.
No. 4 Cincinnati, c.d.
No. 21 Brown & Sharpe, motor in base
4" Pratt & Whitney Spline
4½"x12" Pratt & Whitney Thread Mill
6"x48" Pratt & Whitney Thread Mill

MISCELLANEOUS

10'x3/16" Stamco Gap Shear
10'x14 Ga. Stamco Squaring Shear
No. 8 Whiting Comb. Punch & Shear
No. 2 V & O Press, O.B.I.

SAWS

13"x16" Peerless Standard, m.d.
6"x6" Peerless Universal Shaping, m.d.
No.12 Higley Cold Cut, 16" blade

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No. 2 Knight Vertical, m.d.
No. 1½ Lodge & Davis Universal
No. 2½ LeBlond Universal
18" Cincinnati Plain Automatic (3)
Carter & Hakes Lincoln Type
Fox Lincoln Type
No. 12 Pratt & Whitney Lincoln Type
Becker Lincoln Type
Burr Mfg. Type, 72x11" table
4½x12" Pratt & Whitney Thread
6x14" Pratt & Whitney Thread
18" Cincinnati Mfg.
28" Cincinnati Plain Automatic
36"x36"x14' Bement Slab, m.d.

GEAR MACHINERY

No. 5M Adams Hobbers, m.d.
No. 12 Barber-Colman Gear Hobbers
No. 5 Lees-Bradner Gear Hobber
16" Gould & Eberhardt Gear Cutter
18" Gleason Straight Tooth Bevel Gear Generator
No. 3-26" Cincinnati Spur Gear Cutter
30" Brainerd Auto. Gear Cutter for spur and bevel
No. 3—26", 3—36", 3 Heavy, 4—36", 4—48", 6—60", 6—72" Brown & Sharpe Automatic Spur Gear Cutters
No. 36BM Gould & Eberhardt 3 spindle Gear Rougher
Gleason Spiral Bevel Gear Rougher
12" Ingle Gear Tooth Rounder
24" Cross Gear Tooth Rounder

GRINDERS—CYLINDRICAL

12x72" Cincinnati Universal, 3 motor drive
16x40" Landis Universal, 3 motor drive
10x36" Landis Integral Cam, m.d.
10x52" Landis Plain, m.d.
10x72" Landis Plain, m.d.
12x36" Cincinnati Plain, m.d.
12x36" Cincinnati Plain, belt
12x36" Modern Plain, m.d.
12x42" Landis Plain, belt
12x48" Modern Plain, m.d.
16x120" Landis No. 18 Plain, m.d.
26x96" Landis Plain, m.d.

INTERNAL GRINDERS

No. 10 Bryant belt
No. 20 Bryant, belt
No. 50 Heald Cylinder, m.d., hydraulic feeds
No. 55, 60, 65 Heald Cylinder

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Walker Single Stroke, 10" mag. chuck
14" Pratt & Whitney Vertical, m.d.
38"x38"x12' Gray Planer Type Surface, m.d.
54" Bridgeport Knife
No. 1 Fraser Lapper, 26" plate

BORING MILLS

42" Colburn, 2 heads, m.d.
30" Colburn, 1 turret head
42" Niles-Bement-Pond Car Wheel Borer
48" Niles-Bement-Pond Car Wheel Borer
4" double spindle Barrett Horizontal, m.d.
Sargent Floor Type Horizontal, 2⅝" bar

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¾" Style R Economy Automatic
9/16" Landis 2 spindle, m.d.
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1" Acme 3 spindle
1½" Acme
No. 11-S Rickert-Shafer Automatic, 1" cap., m.d.
1¼" American Bolt Heading Machine

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No. 2 LaPointe, belt
No. 2 LaPointe of Hudson, belt
No. 3B J. N. LaPointe Double

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6" Avey Milband Cutting-off
Klemm Tilting Metal Cutting Band
Espen-Lucas Cold Saw, m.d.
5" Newton Cold-Cut-off Saw
No. 2b Cochran-Bly Cold
No. 3 Nutter & Barnes Cold
No 5, 6 Cochran-Bly Cold
No. 11½ Higley Cold
No. 15 Lea-Simplex
Burr Cold Saw, 24" blade
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Fitchburg Spline Shaft Grinder.
#55 Heald Cylinder.
Lees Bradner Gear Grinder.

MILLERS
#1 P & W Hand Miller.

GEAR MACHINERY
18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
18H Gould & Eberhardt Gear Hobber.
#1 Adams Gear Hobber.
#4—36" B & S Automatic Gear Cutter.
Lees Bradner Gear Grinder.
#3—26" B & S Gear Cutter.

PLANERS
24" x 6' Cincinnati Planer.
24" x 24" x 6' Cincinnati Planer.
24" x 24" x 6' Cincinnati Planer, Box bed M.D.

MISCELLANEOUS
18" Niles Bement Pond Slotter, Motor driven thru gear box.
12 Ga. 30" Throat Quickwork Shear, M.D.
14" Niles Slotter.
1500# Bell Steam Hammer.

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3' Carlton Sensi. Radial, with tapping att.
6' Niles Plain Radial Drill
4-spindle Henry & Wright High Speed Drill
Gisholt Tool Grinder, arr. for m.d.
10"x10" Napier Metal Band Saw
⅝" Shuster Wire Straightener & Cut-off Machine
½" Shuster Wire Straightener & Cut-off Machine

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Good Operating Condition

30" x 30" x 8'
Woodward & Powell Planer
Two heads on cross rail.

30" x 30" x 8'
Cincinnati Planer
Two heads on cross rail.

27" x 27" x 8'
Woodward & Powell Planer
One head on cross rail.

31" x 20' bed
Bradford Engine Lathe.

Niagara Machine & Tool Works
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2—Gridley four-spindle Model H Chucking Machines, M.D.
1—72" x 36" x 10' table Ingersoll Mill
1—No. 2 P & W Shaving Machine

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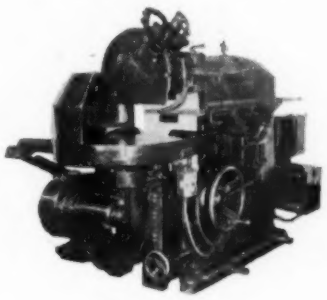
PRODUCTION GRINDER

No. 25A Heald Rotary Surface Grinder



27" diameter face plate.

Maximum distance top of plate to center of wheel 14⅜".

Minimum distance top of plate to center of wheel 7".

Equipped with coolant pump and tank.

With complete electrical equipment.

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14"x6' Mulliner—cone
16"x6' Lodge & Shipley—cone drive

GEAR MACHINERY
Type A Barber Colman Gear Hobber
No. 12 Barber Colman Gear Hobber, M.D.
24HS Gould & Eberhard Gear Hobber, M.D.
9" Pratt & Whitney Gear Grinder, M.D.
11" Gleason Bevel gear generator
Cimatool gear chamfering M.D.
Lees-Bradner Gear Grinder

TURRET LATHES
6x6½" Goss & DeLeeuw

MISCELLANEOUS
8" Bullard Multimatic M.D.
24"x24"x8' Whitcomb Planer
36'x36"x8' Woodward & Powell Planer Rev. M.D.
No. 303 Bliss St. side. Gd. Press M.D.
Lees-Bradner Spline Hobber 6"x54"

DRILLS
4 Spindle Taylor & Finn, M.D.
3 Spindle Leland Gifford, Power feed

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500# B&S Board Drop Hammer.
1000# & 2000# Steam Forging Hammers.
#14 Cochrane-Bly Vert. Miller & Shaper, M.D.
50" G & E Gear Cutter.
#55 Heald Internal Grinder.
10' Bridgeport Knife Grinder.
30"-24" G & E Shapers.
36" Morton Draw Cut Shaper.
No. 2 Baker Keyseater, 2"x20".

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G & E 48" Gear Cutter
GLEASON 10" Spiral Bevel Gear Gen.
GLEASON 6"-18" Bevel Gear Gen.
HEALD No. 70A Duplex Internal Grinder
HEALD No. 60 Internal Grinder
INGERSOLL 24" Cutter Grinder
LANDIS No. 3½ Int. Hyd. Race Grinder
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100 Assorted Milling Machine Attachments
DIVIDING HEADS
Vertical-Slotting—Rack Cutting
For BROWN & SHARPE—CINCINNATI — KEARNEY & TRECKER — Le BLOND — HENDY — OHIO — ROCKFORD — KEMPSMITH

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ALL ANGLE MILLING ATTACHMENTS
Style "C"—Back Geared, Motor Drive, 3 phase, 60 cycle, 220 Volt

P. & W. No. 12 Multi-Spindle Drill
NATCO C-13 Hyd. Multiple Spindle Drill
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FELLOWS #712 Gear Shaper
LANDIS 4" Single Head Bolt Threader
ACME 1" All Steel Upsetter
SAUNDERS 8"-18" Pipe Threader
THREADWELL 12" Pipe Machine
GISHOLT Precision Balancing Machine
LONG & ALSTATTER Angle Shears
AMERICAN 30"x30"x14' Planer 2 heads, M.D.

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4 spdl. Sigourney (4)

4 spdl. Henry & Wright (19)

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26" x 36" x 10' Ingersoll

26" x 25" x 12' Ingersoll

GEARS CUTTERS

No. 60BM Gould & Eberhardt Bevel Gear Rougher (2)

GRINDERS

(See page 315, Hill-Clarke Cylindrical grinders)

No. 40 Bryant Plunge Cut, Wide Wheel, Oscillating

No. 10 Lees-Bradner Spur Gear Grinder 1½" dia. New Yankee Drill Grinder

TURRET LATHES

18" Libby

HILL-CLARKE MACHINERY CO.
649 Washington Boulevard
Chicago, Illinois

OTT MACHINERY SPECIALS

AUTOMATICS, Gridley, 2¼ & 3¼" S.S.
AUTOMATICS, Gridley, 1¼ & 2⅝" Model F
AUTOMATICS, Cleveland, 2" 18" feed Model B
AUTOMATICS, Cleveland, ⅞" 4 spdle. cut-off, M.D.
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AUTOMATICS, #22, 23 & 24 New Britain
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MILLING MACHINES, Craftsman #1 & 2
MILLER & DRILLER, Knight #2
PLANERS, 36x36"x10' Hamilton 2 Heads, M.D.
PLANERS, 42x42"x12' Ohio, 1 Head, M.D.
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No. 9 in a Series of Tips on "Keeping 'em Turning"
by Arch Metzger, 43 years at LeBlond.

I'm Tellin' You...

Eight of my sidekicks here at LeBlond have already given you lathe operators some tips on taking care of your machines. But I'd like to hand out some reminders on how to take care of *yourself*. A lathe really isn't a dangerous machine unless the operator gets careless or forgets one of these common sense rules. A good way to be sure you'll be on the job every day is to remember all of them.

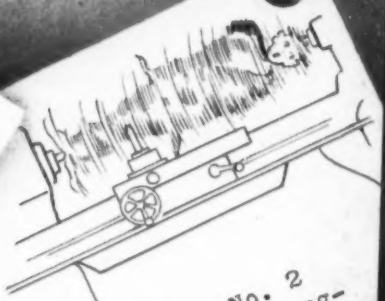
STOP

STOP YOUR MACHINE BEFORE YOU -

1. Caliper your work
2. Clean chips from work or tool
3. Oil or wipe machine

FASHION NOTE - No. 1

Save your eyes. They're the only pair you have. Wear goggles when your operation makes the chips fly.



FASHION NOTE - No. 2

Jewelry is excess bag- gage. Don't wear rings wrist watch, or pocket chain. You might get the whirl of things b fore you know it.

HOLD TIGHT

Mount work securely, clamp as close to tool post as possi- ble. Be sure tool is in correct position.

FASHION NOTE - No. 3

Don't feature a collegiate drape shape in your work clothes. Wear tight fitting clothes with no tie, or tie tucked in. Roll up your sleeves.

WATCH YOUR STEP

See that the floor around your lathe is always clean. Keep oil wiped up. It's slippery. Don't let chips and shavings pile up. Don't let your mind wander.

ARMY E NAVY

THE R. K. LeBLOND MACHINE TOOL CO

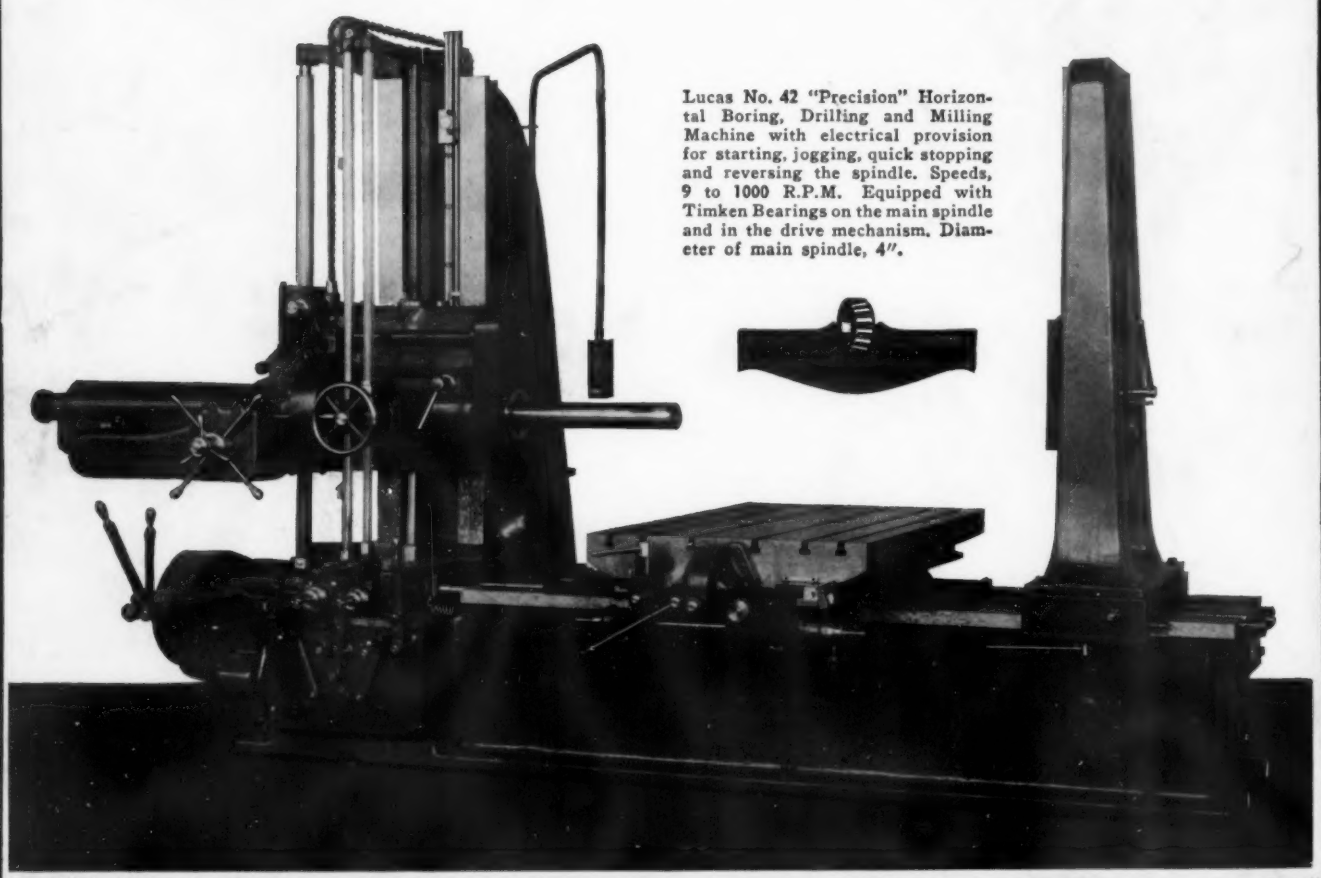
CINCINNATI, OHIO

Largest Manufacturer of a Complete Line of Lathes

The presence of Timken Tapered Roller Bearings on machine tool spindles is taken for granted nowadays. Modern precision standards demand them. Any machine so equipped is capable of doing a first class job; but it can do a still better and more economical job when Timken Bearings also are used on all driving shafts, feed mechanisms and at other positions. Then it is *completely* protected against the multiple enemies of performance and endurance—friction; wear; radial, thrust and combined loads; and misalignment of moving parts.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS
"ALL THERE IS IN BEARINGS"

Engineers who make full use of Timken Bearings in the machines they design give their companies a twofold advantage—*better* machines and *better selling* machines—for wherever machines are bought and sold the trade-mark "TIMKEN" is an indication of superiority. The Timken Roller Bearing Company, Canton, Ohio.



Lucas No. 42 "Precision" Horizontal Boring, Drilling and Milling Machine with electrical provision for starting, jogging, quick stopping and reversing the spindle. Speeds, 9 to 1000 R.P.M. Equipped with Timken Bearings on the main spindle and in the drive mechanism. Diameter of main spindle, 4".